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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

REPORT OF SURVEY

for

THE NATIONAL INSTITUTE FOR THE BLIND.

THE ROYAL GLASGOW ASYLUM FOR THE BLIND.

Investigator: C. B. Fox.

Period: 27th January to 30th January, 1930.

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I. INTRODUCTION.

A survey was made of the Royal Glasgow Asylum for the Blind for four days to ascertain

i. whether blind workers are capable of operating any machinery worked by power;

ii. what, if any, are the trades followed by the blind in Glasgow which have not been attempted in England; and

iii. the effects on output, if any, of the introduction of a minimum wage.

It is the intention of this report to combine the first and second of these in a short description of all the occupations undertaken by the Royal Glasgow Asylum for the Blind. These may then be used as a guide for those institutions in this country which desire to consider new trades for their workers.

The men workers at Glasgow receive a minimum wage of £2. 10. 0. per week per man and the women receive £1. 13. 0. per week. Average figures have been prepared for each group of workers for the quarter ending on the 30th June, 1929; these figures are referred to as the "average wages earned".

One of the main features in which the Royal Glasgow Asylum for the Blind differs from the institutions in England is that it has incorporated most of the small institutions in Glasgow and the West of Scotland. The remaining workshops in the area are gradually being closed down, and the workers are being brought into Glasgow to work. All the old workshops have been closed, and it was possible to select a building with all the requirements of a workshop. This has obviated some of the undesirable conditions which exist in England where workers who are employed at the same industry occupy several rooms of small dimensions, thus necessitating more sighted supervision. By this amalgamation better accommodation has been provided for each department, with a consequent reduction in overhead charges. Each department has now a larger number of workers, and this is responsible, in a great measure, for the institution being able to secure orders for the wholesale trade. If the small institutions in England were to amalgamate in definite centres, making large factories for the basket making, the knitting, the brush industries, etc., there would then be the same scope for supplying the wholesale market, and all the facilities would be available for producing at a lower cost.

II. TRADES AT CASTLE STREET.

1. Wire Department.

Wire springs for attachment to beds are made in this department. Orders are obtained from both the wholesale and the retail trades. The period of training for this trade is five years, and only men are employed.

There are three machines run by power and four worked by hand. Since all the hand machines and two of the automatic ones are easily manipulated, the workers are interchangeable on them. The remaining automatic machine requires a little more attention; the same man is therefore always detailed to operate it. This man has shown great aptitude and has learnt the work quickly. The work does not call for any special knowledge, but requires care in placing the wire correctly in the allotted places. The worker of this machine is partially blind, but totally blind workers manipulate the remaining machines. The average wages earned by these machine workers for the quarter ending on the 30th June, 1929 was 16/- per week, but this figure has now been increased.

The remaining section of this department deals with the assembly of these wires for the definite sizes of beds. Both totally and partially blind workers are employed here, and their average earnings approximate 15/- per week per man. The highest wage earned for the quarter under consideration was 25/- per week, while the lowest was 9/7 per week.

Considerable accommodation is essential for the success of a department dealing with bed springs.

Riddle Department.

The preparations of sieves by men is considered by the Royal Glasgow Asylum for the Blind as merely an occupation and not as a trade which could be successfully carried out for industrial purposes.

The department is placed within the control of the wire department for two reasons.

i. The Foreman of the wire department has an intimate knowledge of the preparation of riddles.

ii. The overhead charges of the department are reduced by placing the Foreman in charge of both departments.

The less intelligent blind are employed here, and the highest wage earned is 14/8 per week.

2. Basket Making Department.

The period of training for this department is five years. There are fifty-three workers in the department, and the average wage earned is 20/- per week per man. The maximum wage earned is 38/- per week, while the lowest is 7/1 per week.

There are four workers who have earned more than 30/- per week.
" " eleven " " " " between 20/- and 30/- per week.
" " six " " " " less than 10/- per week.

The journeymen are separated from the trainees.

This department has ample room allotted for the workers. The tanks for soaking the raw materials are indoors and are close to the workers. In general, the working conditions appeared to be distinctly good.

3. The Brush Department.

The period of training is five years. There are twenty-three journeymen in this department and, as in the Basket Making Department, they are separated from the trainees. The average wage earned was 23/9½ per week per worker. The maximum wage was £2. 15. 4. and the lowest 11/3 per week.

There are three workers who have earned more than 30/- per week.
" " twelve " " " " between 20/- and 30/- per week.

It is believed that the wage earnings have increased since the quarter ending in June, 1929.

The brushes made in this department are mainly for the Corporation, for whom the Royal Glasgow Asylum for the Blind are the sole suppliers. This monopoly has been secured in direct competition with the local suppliers. A notable success has been achieved by the introduction of a rotary brush for the carts of the Corporation.

The workers sit in gangs of four round a circular table, at the centre of which the pitch is kept in small troughs. In every gang there is at least one partially blind worker whose duty it is to see that the quantity of pitch is properly maintained: this ensures that the bristles are always immersed to the same depth. The department has not experimented with six workers at the same table; but if such an experiment proved successful, the area of floor space per worker would be considerably reduced.

A further notable feature of this department is the extraction of the vapours from below, and not, as is usual, by cowls above the work. One of the two rooms has the ordinary overhead cowl for extracting vapours, while in the other the vapours are extracted from below. In the former room, vapours are always present, while the latter room is always clear and the conditions for working are extremely good. The new extraction system was installed by a Nottingham firm.

4. Mat Making Department.

This trade is considered as an occupation for the less employable blind. The mats are made by hand - not on looms as in England. Motor mats, cork fenders etc. are the usual types of articles made. The evarage wage earned was 9/3 per week per worker, while the highest wage earned was 20/- per week.

5. Boot and Shoe Repair Department.

The period of training for this trade is three years. There are no journeymen as yet - all the workers are still trainees. There are twenty-nine trainees to two sighted supervisors, one of the latter being the foreman. The average wage earned was 25/- per week per worker. Although the department contains only trainees, numerous local orders for repairs were being executed.

III. TRADES AT POSSILPARK.

1. Knitting Department.

There are only four girl workers in this department the remainder being trainees. It was noticeable there were more 'round' machines than 'flat'. The average wage earned was 7/2½ per week per girl. The Royal Glasgow Asylum have not had the same success in this department as many of the English institutions.

2. The Furniture Department.

The introduction of this department has created a great deal of interest among the blind in this country. Although the department has been in existence for a considerable period, it became a great success only when it was placed on a mass production basis: its success was then immediate. During the last financial year, a net profit of over £800 was made by this department. The department is divided into three sections.

i. Carpentry Section.
ii. Assembling Section.
iii. French Polishing Section.

i. Carpentry Section. This is the machine section, the period of training for which is five years. The management consider that it is essential for the majority of the workers to have some sight in order to work the machines.

The machines used are the following:

Two Squaring Saw Machines.
A Band Saw.
Two Boring Machines.
A Panel Planing Machine.
A Morticing Machine.
A Tenoning Machine.
A Dovetailing Machine.
A Sand-papering Machine.

Workers are interchangeable on all these machines except the last one, for which the management consider that the workers must become specialised.

The average wage earned in this section was approximately 25/- to 30/- per week per worker, but the ability of the workers was increasing. For the week in which the investigator visited the department, the men on the Sand-papering Machine earned 55/- per week.

ii. Assembling Section. Here there are thirty workers, but there is no necessity for them to possess sight. The period of training is five years. The average wage earned was 22/6 per week per worker. There are, however, three sighted Finishers who act as Charge Hands.

iii. French Polishing Section. Twenty women are employed in this section, and the average wage earned was 12/6 per week per girl, though a tendency towards improvement is shown. The management consider it necessary for these workers to be partially sighted, and a completely sighted girl is employed to deal with the first coating. The work in this section appears to be very attractive to the blind, for all applicants to the factory make special requests to be employed in this section.

Throughout the Furniture Department a considerable space was required for the work. In the Machine Section alone, it appeared necessary to have at least twelve hundred square feet, while in the Assembling Section even more room was necessary.

3. Chair Caning Department.

The period of training in this department is five years. It appeared necessary to have workers with some sight for this work, though a totally blind man was progressing exceptionally well. All the workers were trainees.

The management did not consider this trade a successful one when placed in competition with sighted industry; the trade was therefore treated merely as an occupation.

4. Wire Brush Department.

Fifteen girls were employed in this department in making small wire-drawn brushes, but only one of these was a journeywoman: the remainder were trainees. The period of training is three years. Both totally and partially blind were employed. The department worked spasmodically owing to the lack of demand for its product.

5. Singer Sewing Machine Department.

The period of training here is three years. There were sixty girls employed in this department, some being totally blind, and others having partial sight. The outstanding worker, however, was a totally blind girl. There were only twenty-one journeywomen, the remainder being trainees. The average wage earned was 5/3 per week per worker, though many of the trainees are now earning more than this figure.

Each machine is driven by a separate motor.

6. Upholstery Department.

The period of training is four years. There are fifteen men in this department, some totally blind: they are all trainees. At present there are two sighted Charge Hands, but their supervision may not be necessary once the training of the workers has been completed.

7. Mattress Making Department.

The period of training is three years. There are twenty men in this department, the majority of whom are totally blind. The Charge Hand, also, is completely blind. The average wage earned was 21/9 per week per worker.

IV. THE EFFECTS OF THE INTRODUCTION OF THE MINIMUM WAGE.

In 1920 the Municipal Authorities took over control of the Institution, and in February 1921 they sanctioned the introduction of a minimum wage of 55/- per week per worker, to be paid with retrospective effect from November 1920. This figure, however, was reduced to 50/- per week for men and to 33/- per week for women in November 1921. Prior to November 1920 the workers were paid on a piece-rate basis determined by the sighted trade union authorities for the locality. Unfortunately a number of the books of the Institution were destroyed when it was municipalised, and records for the previous period for two departments only (Baskets and Brushes) are available. From the remaining records, the wages earned on the basic piece-rate for the quarters ending in June 1920, in June 1921 and in June 1929 are as follows.

1. Department.	2. Number of Workers.	3. Average Wages earned per week per worker.	4. Number of Workers.	5. Average Wages earned per week per worker.	6. Number of Workers.	7. Average Wages earned per week per worker.
Basket	28	42/-	30	34/-	53	20/-
Brush	14	43/8	16	32/-	23	23/9
	June 1920.		June 1921.		June 1929.	

The figures show a decided decrease in the wages earned for both departments.

The average wages under column 3 were paid to the workers as their actual earnings under the piece-rate system; but columns 5 and 7 give the average wages earned, though the remuneration paid was always the same - 55/- and 50/- respectively. For the quarter ending in June 1920, every effort made by the workers was rewarded by additional remuneration, but since the minimum wage was fixed at a figure above the average wages earned, the financial incentives to work did not become operative until the workers had increased their output on a pro-rata basis beyond the average output of the department. This effort to bring the actual piece rates into operation has not been made by the workers - the actual wages earned having diminished. Consequently, the introduction of the minimum wage of 50/- per week per worker - a figure greater than the average wages earned - has caused a lack of incentive to the workers even to maintain the output previously obtained. A point for consideration as an experimental measure would be to place the minimum wage within the limits of the average worker's capacity, so that, once the minimum wage is obtained, the piece-rate incentive to increase output would become genuinely effective. The method we would suggest is that the fixed piece rates be increased by the ratio of $\frac{\text{mimimum wages}}{\text{average wage earned}}$. This would then bring the actual piece rate system within the capacity of the worker and would tend to induce the operators to increase their output.

In conclusion, we wish to express our thanks to Mr. George Hanly, General Manager of the Royal Glasgow Asylum for the Blind, for all the assistance afforded us in obtaining this information.

(Signed) George H. Miles.

24th March, 1930.

For Director.

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

REPORT
OF INVESTIGATION AT
THE LONDON ASSOCIATION FOR THE BLIND
KNITTING FACTORY,
144A, WARWICK STREET, S. W. 1.

Period: 6th - 25th January, 1930.
3rd February - 5th April, 1930.

Investigator: C. B. Fox.

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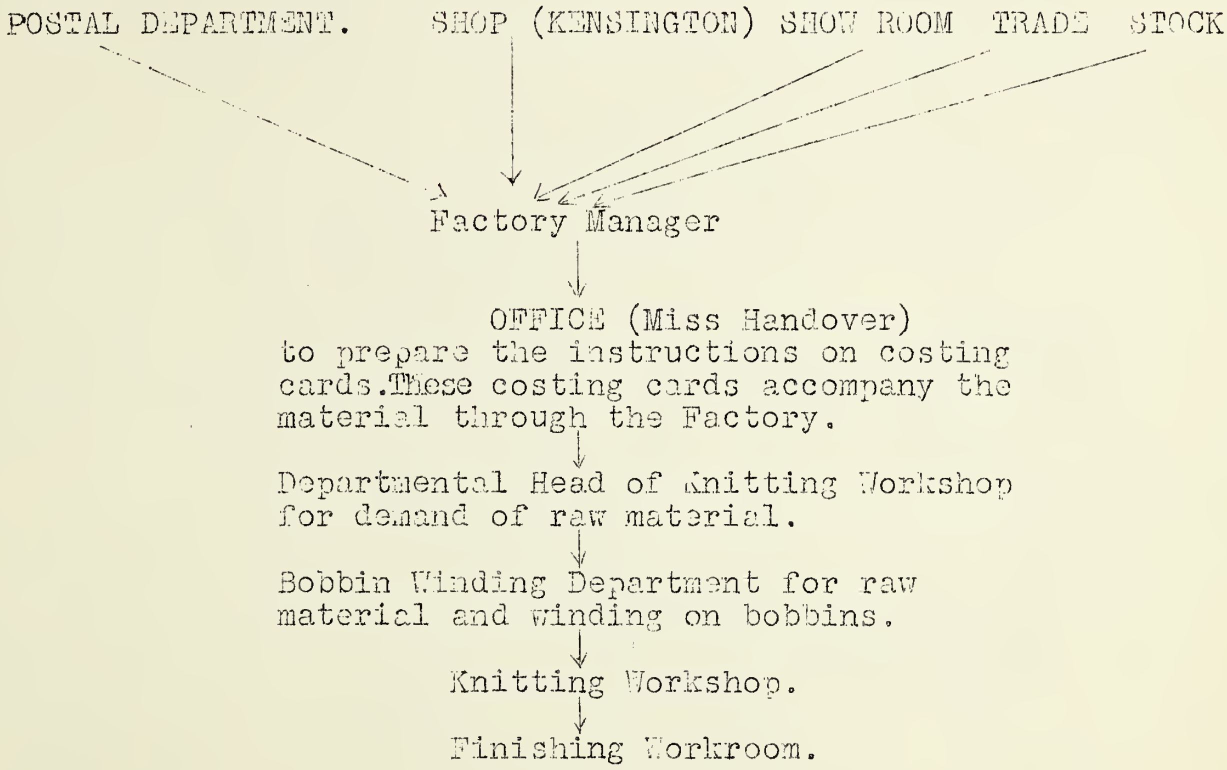
I. GENERAL.

1. Introduction.

The London Association for the Blind have the largest knitting factory among the blind institutions in England, and they supply garments to many of the large retail stores.

The following diagram indicates the departments and processes through which orders for knitted garments pass before completion and dispatch.



POSTAL DEPARTMENT. SHOP (KENSINGTON) SHOW ROOM TRADE STOCK

Factory Manager

OFFICE (Miss Handover)
to prepare the instructions on costing cards. These costing cards accompany the material through the Factory.

Departmental Head of Knitting Workshop for demand of raw material.

Bobbin Winding Department for raw material and winding on bobbins.

Knitting Workshop.

Finishing Workroom.

For the purposes of simplification we intend taking each department in turn. Later, when the complete procedure of the factory has been explained, a suggestion will be made for the introduction of a new department - a Planning Department - one which cannot be overlooked in a factory dealing with numerous orders. When a factory experiences great difficulty in meeting orders on dates promised, there is a tendency to lose a certain amount of factory control in order to meet the demands on the dates promised. But still worse are the conditions when the factory is actually unable to deliver orders on the date promised, for it suffers from a reputation through which it tends to lose a number of orders - a reputation which could easily be avoided if sufficient attention was given this subject.

The Planning Department would arrange the work so that all demands would be met on the dates specified, and so that the factory would have a regular flow of material.

2. Raw Material for Orders.

From the diagram on p.1, it will be seen that all orders received are first centralised at the Factory Manager, and then passed on to the office where costing cards are prepared. The cards are then sent up to the Knitting Workshop (second floor) where the Departmental Head estimates the quantity and type of wool required to complete the order. This is inscribed on the costing card.

Since there are three main types of machines in the Workshop - 7,8, and 10 gauge knitting machines - arrangements were made during the investigation to specify, on the costing card, the type of machine on which the garment would be knitted.

3. Standardisation of Demands for Raw Materials.

The demands made for wool for specific orders were frequently found to be at variance with the actual requirements. In some cases too little wool was requested, and this caused a definite loss of time. When this occurred, it was decided either to await a fresh supply of wool which had to be wound on bobbins, or to take the material off the machine: with the latter process the garment had to be completely 'picked-in' when the additional supply of wool was received. Both alternatives cause delay; and both irritate the workers, who rightly think that more accurate requirements of wool could easily be determined, particularly if several garments of the same model have already been made. In the majority of cases, however, the demand was usually in excess of the actual requirements. Figures for four weeks will be found in Appendix X. They show that there was a surplus of 25.37 per cent: this includes all orders for wool during this period, even those that were short of actual requirements. Instructions, therefore, were being issued to wind at least 25.37 per cent. more wool than was necessary for the particular orders, and this in itself was responsible for delaying the completion of garments.

On this question of determining more accurately the actual quantities required for each specific garment, it may be contended that if excess is wound, the quantity left on the bobbin would be ready for issue for the next demand, and that the time saved on the second issue would compensate for the time lost on the original demand. We are, however, convinced that in actual practice the wool left on a bobbin for future issues tends to become dirty and so to spoil the next garment on account of 'shady work'. Garments are frequently rejected on the grounds of 'shady' material. Dirt accumulates on the material on bobbins. Some of this is caused by the frequent handling of the bobbin when it is being returned to the Bobbin Winding Department and re-issued. In view of this we urge consideration of the method of winding only the actual requirements.

In order to assist the management in determining more accurately the requirements of raw material, the majority of the stock models of last year (1929) were examined. Several costing cards of each model were studied and the information collected was placed before a Works Committee, which agreed to new standards of requirements for these models. At this meeting it was explained that these standard requirements would be of great assistance as guides for complying with private orders. For all new stock models, it was decided to record details of the first twelve garments of each model in chronological order with the quantity of wool used, and from these data to establish a standard of the requirements. This meeting was held on the 20th February, but, beyond an alteration in demand for Model 1299, no ~~other~~ alterations have yet been made. We strongly recommend that every effort be made to obtain more accurate data of requirements of raw material for specific models.

The standardisation of requirements for stock models has two advantages.

i. It prevents loss of time in waiting for additional supplies when the original demand has been inadequate.

ii. It reduces waste due to the accumulation of dirt on the excess material on bobbins. If not detected at this stage, it is then responsible for the subsequent rejection of garments on account of 'shady' material.

Owing to the many improved methods, both of worker and machine, we advocate that these standards should be reconsidered each year, and, if necessary, revised. It should be the aim of the factory to reduce the requirements of old models with a view to lowering the cost of output per garment.

A further method of obtaining guides towards more accurate data is to record the weight of the first garment of the new model in the Inspector's Model Book. We recommend that this be introduced at once.

When the demands have been noted on the costing cards they are sent down to the Bobbin Winding Department in the basement.

II. BOBBIN WINDING DEPARTMENT.

This department is responsible for the winding of raw material on bobbins, and for the storage ofthe raw materials.

1. Winding of Raw Materials on Bobbins.

There are four machines for the purposes of bobbin-winding, each machine having six spindles. Three of these machines are placed in alignment and are connected by one long shaft to the motor which drives them. The fourth machine is in a corner of the room, and is run by a separate motor. This machine has not been used for a considerable time. Both fully sighted and partially sighted girls are employed here and changes during the period of the investigation have been frequent. It was customary for each girl to manage one machine.

A machine consists of six spindles on each of which a bobbin revolves. Skeins are placed on skeiners which are attached to the machines. A pair of skeiners are placed directly below each spindle. When the wool is placed on a skeiner, the thread is passed through guides, on to the waxing spindle, and then on to the bobbin. By means of a cam shaft and a guide for the thread, the wool is made to travel up and down around the bobbin.

The mechanical strengths of the wools vary considerably. The management have found it necessary to purchase some of their yarn on 'cones' and not in skeins, as this is an easier and quicker method of winding. The pull in winding certain types of wool from skeiners is so great that it caused fracture, and consequently an unusually long period of time was required to wind a bobbin. The method of purchasing certain yarns on 'cones' and then winding on to bobbins was considered more economical than winding them from skeins. Despite this fact, the bobbin-winders found some of the wool which is supplied in skein form extremely difficult to wind owing to poor physical strength. A careful examination of the place where the wool usually broke indicated that fracture occurred when the thread revolving round the bobbin was at its maximum height. The position of the thread at this point did not lie on the axis of the waxing spindle. The wool merely tipped the wax but did not revolve on its axis, so that the pull from the bobbins acted directly on to the skeiners. It was considered that this strain was too great for the wool to withstand fracture. To prevent this extra strain, the wool was made to revolve once round the waxing spindle so that the tension on the skeiners would always be approximately the same. The winders stated that certain wools which gave great difficulty to wind with the earlier method gave less difficulty with this method. A further advantage of the new method was that it ensured a far better process of waxing the yarn, which was greatly appreciated by the knitters. Dissatisfaction had been expressed in the Workshop on account of the wool not being waxed sufficiently. Many of the knitters rewound bobbins in order to wax the wool. The necessity for re-winding yarn has now been eliminated.

Another cause of some of the difficulties experienced in winding was that care was not taken when placing the skeins on the skeiners. Instructions have now been issued to the winders to ensure that all skeins should be well shaken out before being placed on the machines, and that there should be no twist on the yarn when it is placed on the skeiners. If sufficient precautions are taken to ensure that these points are not overlooked, the ease and speed of winding should be improved, thus yielding increased production.

On making further enquiries from the knitters into other causes of complaints against the condition of the yarn, it was discovered that the knots tied by the bobbin winders were too large. The knitters tie a small reef-knot, so that when penetrating the material - in knitting - the knot should not leave a large hole in the material. The winders, however, tied a weaver's knot, and this was responsible for leaving large holes in the material. It should be stated that the winders were ignorant of the fact that these knots were detrimental to the work on the knitting machine. All the winders have now been instructed to tie reef knots, and to cut the ends of the knots short in order to decrease in every way the possibility of injuring the material on the machine.

Wool is wound from skeins or cones on to bobbins, to a maximum of one pound of material per bobbin. The winders have an exceptionally easy method of adhering to these instructions, since cones contain eight ounces and skeins two ounces of material. It is interesting that on no occasion was a bobbin ever found to contain a pound of wool after winding was performed: the weight of material on the bobbin was always found to be less than one pound. We are informed that the wool varies in weight, the variation depending upon such atmospheric conditions in the store-room as humidity, etc. Despite this fact, on no occasion was a bobbin discovered to contain material beyond one pound in weight after winding. We would like to place a rider before the management, if it is possible to purchase wool with a definite moisture content. If this is possible, and the requirements of the factory continue to increase, it might be worth installing suitable appliances in the storage-rooms to ensure the same humidity throughout the year.

The bobbin winders have extraordinary variations of output from day to day. These variations are limited by the quantity of orders received. Attempts are made to wind all orders received each day. The issues from this department are given in Appendix I: they show a variation of more than one hundred pounds from one day to another. This tends to indicate over-staffing, and it is due to defective planning. We consider, however, that once a Planning Department is installed, these wide daily variations in output will cease.

All orders for material which is out of stock are immediately returned to the Factory Manager with the remark "N.S." - no stock: steps are then taken to obtain a supply of the material.

It is the duty of the winders, when time permits, to wind the many 'returns' of the same blend on to one bobbin, so as to reduce the number of bobbins in the Return Cupboard.

All winders are paid on time rates.

2. Check on Winders.

Arrangements have now been made for winders to place some definite distinguishing marks on the back of the docket forms, so that, should a report be received of poor winding on any bobbin, the fault can be traced to the winder concerned.

3. Waste Wool.

In the process of winding, all the waste material obtained was originally thrown on the floor. Since the waste wool is sold, the floor had to be swept and the waste collected. To prevent the waste from being thrown on the floor, bags are now provided at convenient places on the machines, and the operators have been instructed to throw waste into these bags. The floor is thus always kept free from waste, while the room has a distinctly neater appearance.

4. New Design for Caps on Bobbins.

The paper caps placed over bobbins containing light coloured wool to prevent dust and dirt settling on the material, did not fit closely on the bobbin. As a result of this, material was frequently found to be dirty and it was consequently wasted. A new cap has now been designed which fits the bobbin closely, and which should tend to prevent any dust etc. from settling on the material.

5. Artificial Illumination.

There are two lights in this winding room - one a 60-watt bulb, and the other a 100-watt bulb. At the time of the investigation they were placed in such positions that the operators attending the machines stood between the light and their own work. The positions of the bulbs have now been altered to take full advantage of the light, and the total wattage of the room has been reduced to 120 watts. The bulbs are frosted, and are of 60 watts each. The workers have expressed their appreciation of the change.

6. Storage.

We were informed that on occasions when the factory was at its busiest the Bobbin Winding Department felt the need for greater storage accommodation. It was found, on investigation, that the maximum capacity of the present racks was in the neighbourhood of 6263 pounds.

i. Increased storage Accommodation. Means have been devised to provide a total increase in capacity of 1896 pounds - an increase of 30.3 per cent. The methods adopted to obtain this increase are as follows.

Extensions to present racks, forwards and sideways.
Additional racks.
Addition of a fourth shelf to racks.
New layout in alcove 4.

The plan of the stores with suggested alterations is shown in Appendices II and III. The extensions to the present racks are being made without unduly decreasing the space available for gangways. In some of the alcoves, it was noticed that a space existed between the top bundle of wool and the shelf above it. This space has now been utilised by placing the shelves closer and by introducing a fourth shelf.

In alcove 4, however, the accommodation for storage, taking linear measurements of the racks only was 8 feet 4 inches plus 9 feet 6 inches plus 6 feet plus 5 feet eight inches = 29 feet

6 inches. With the proposed new layout, the racks will now occupy 3 by 7 feet 6 inches by 9 feet 6 inches = 22 feet 6 inches plus 9 feet 6 inches = 32 feet, an increase of 2 feet 6 inches.

These racks also will have four shelves each and will be placed as shown in Appendix III.

From these extensions, alterations, etc. the storage accommodation will now be increased as follows.

Alcove 1	Extension	154 lbs.	
	New shelves	108 lbs.	262
Alcove 2	New rack	360 lbs.	
	New shelves	no increase, but greater accessibility	360
Alcove 3	-	-	-
Alcove 4	New shelves	480 lbs.	
	Extra 2'8" linear measurement	126 lbs.	606
Alcove 5	New shelf	96 lbs.	
	New rack	228 lbs.	324
Passage	New rack	180 lbs.	
	New shelf	60 lbs.	
	Extension	104 lbs.	344
	Total additional accommodation available		1896 lbs.

(ii) Adoption of Improved Type of Rack. With the help of Mr. Rawden an improved type of rack has been designed which gives greater stability and increased flexibility of accommodation to meet the large fluctuations of stock held. The distance between the shelves is to be determined by the standard size of the packets of wool to be stored, and calculated so as to allow just sufficient space for three packets to be stored one above the other. The vertical plywood partitions are to be moveable and will fit into grooves placed at intervals of six inches. The amount of accommodation allotted to each blend of wool will then be varied to suit the quantity in stock at any one time, thus avoiding the necessity of keeping vacant large areas on the shelves when the stock of any blend is low.

(iii) Distribution of Stock. It is also recommended that care should be exercised in allotting the various blends to their positions on the shelves, to ensure that those blends which are in frequent use are placed in the most accessible positions - that is, not on the highest or lowest shelves, and reasonably close to the office door.

III. THE KNITTING WORKSHOP.

1. Old System and Layout of Work.

There are two rooms in which knitting is performed. One is an extremely large room containing sixty-six machines while the other contains only ten machines. The machines in the large room are placed in four long rows, while those in the small room are in two rows. Some of the machines face each other, while others do not, but there appears to be no reason for this variation.

There were four charge-hands for all these machines. Three of the charge-hands worked behind a table in the corner of the large room, while the fourth worked in the small room. The number of machines allotted to each charge-hand varied from fifteen, seventeen, eighteen to twenty-four. The machines under any one particular charge-hand were not placed in a definite position in either of the rooms, some being in each of the rows in the large room, and the remainder in the small room. The charge-hands were responsible for instructing the workers how to prepare the garments, and for determining whether the material was made well enough to pass on to the inspectors. This examination consisted of determining if the sizes of the garments prepared were according to the ultimate length required.

(An allowance had to be made for shrinkage of the material.) They also had to 'mend' any holes which might have occurred in the garment due to dropped stitches and to large knots in the wool. It was customary for the machine workers to come to their charge-hands for instructions.

In order to deal with difficulties the blind operator experiences on the machines, four 'pickers-in' were employed; but of these, only three actually attended to difficulties, while the fourth was often employed on cleaning the machines, assisting in picking-in during her spare moments. Machines were allotted to the pickers-in in the same varying fashion as they were to the charge-hands. They ranged from 22, 23, to 25 machines, and occupied varying positions in the workshop.

When a machine worker required the assistance of a picker-in she usually went up to her and informed her of the cause of the break-down. The operator then had to wait until the picker-in could attend to her. There was therefore constant walking about on the part of the machine workers. They had to 'chase' the charge-hand for instructions and for passing their garments on to the inspectors, while they had to go to the picker-in whenever they required the use of her services. Besides this, the machine worker often went down to the Bobbin Winding Department to make enquiries for more wool etc.

All inter-departmental instructions were issued verbally, and enquiries between departments were answered in person. Although a departmental 'phone is installed throughout the factory, it is not fully used. Walking about is a most expensive method of dealing with enquiries. The management of this department were usually too occupied in performing these chasing duties, and "had no time" for anything else. We were informed that the management experience a particularly "trying time" during the rush periods. We can understand the truth of this, for the conditions under stress of work must be chaotic.

The issuing of verbal instructions is an unsatisfactory practice. It has often caused misinterpretations, and has led to many arguments and apologies.

2. New Procedure.

The following changes have been introduced.

The machine workers were divided into five sections, and each of these sections having a definite compact position in the workshop as will be seen from Appendix IV. To each section is attached a charge-hand and a picker-in, except in sections III and V. Since Section III has twenty-one machines, two pickers-in have been allotted, while the charge-hand in Section V is also the picker-in of this section. The group of workers in this last section are considered the best workers in the workshop, and it was thought that the amount of work required from a picker-in would be so negligible, and that the charge-hand would be able to perform the double duties. In moments of severe pressure, assistance can always be obtained from one of the pickers-in from the large room.

Observation indicated that long waits occurred owing to machine workers waiting for a picker-in under the old system. In one instance - the only occasion on which timings were taken - one of the best workers showed a productive time of 33.9 per cent. only. The full period of timing was one hour. It was extremely difficult to obtain accurate data as to the most economical ratio of machine workers to pickers-in and to charge-hands, as the workers were repeatedly having to wait for work. Throughout the period of the investigation of the workshop, thirteen girls were in receipt of unemployment benefit, but despite this fact numerous waiting periods occurred amongst the remaining workers. Instances have occurred of some of the workers working only from one to one and a half days in a working week of five and a half days. If the girls were retained in employment on sympathetic grounds, one can appreciate the motive, though in actual fact the sympathetic action is entirely misdirected. While on unemployment benefit a worker receives from twenty-five to thirty shillings weekly. If, on the other hand, surplus workers are retained, they prevent each other from obtaining their maximum output and consequently their maximum wages, since they are paid on piece-rates. But when workers are employed only for a day or so per week, they are given some compensation benefit depending upon what the workshop management consider judicious. Waiting time is not recorded and, therefore, is not paid for. In this manner, if a girl who is retained and works only approximately two days, she may receive a compensation of approximately five shillings to seven shillings and sixpence - the range being from five shillings to ten shillings weekly. Her total takings may then amount to

	15/-	augmentation
	5/-	work for two days.
	7/6	compensation for waiting period
Total	27/6	

If this is the usual figure for this particular worker, she will receive a similar amount when in receipt of full unemployment benefit.

An experiment was attempted for a fortnight with a section of twelve machines to which a charge-hand and picker-in were allocated. The type of work of some of the girls placed in this section was not familiar to the charge-hand, but despite this fact there was a tendency for the wage-earnings of the individuals to increase within the first week. No definite statement can be made to this effect, as the total waiting periods in the previous weeks were not recorded. Assuming the waiting periods to be approximately the same as for the three or four weeks prior to the experiment (the same output in the workshop was being maintained at this period) there was a general increase in wage earnings, as will be seen from Appendix V. In this Appendix, those workers marked with an asterisk are ten gauge machine-workers who are continuously employed. Their wages should be particularly noticed.

The second week showed a still further increase in production. Both operators and management were unanimous in the successful adjustment of sighted supervision to the number of blind workers. The picker-in had now only twelve operators to attend to, and this considerably reduced the time spent in waiting for attention. The duties of the charge-hand, however, were amended slightly. She was called upon to make a continuous inspection while the garment was on the machine with a view to detecting errors immediately after they had occurred. This obviated all unnecessary work of completing a garment which was already faulty. A 'mender' was installed, and she took over the duties of mending from the charge-hand. The charge-hand issued instructions, measured the garments which were continuously examined while on the machine, and made necessary arrangements for the future work of the operators, so that no time should lapse between completing one order and commencing the next. The departmental inspectors reported that the quality of the work from the experimental section was ~~in a~~ better ~~condition~~ than that from the rest of the workshop.

In view of all these reports, the management agreed to divide the workshop into sections. Girls were engaged and taught the duties of the picker-in. A mender, too, has been taken on the staff. Until these workers are capable of carrying out their duties without any further instructional assistance, the workshop will not receive the full benefit of the change. Periods of waiting for the picker-in to attend have been considerably reduced, while the charge-hands should avoid all additional work being performed on an already faulty garment. Errors of incorrect pattern and measurements should also be eliminated, as the charge-hands are now continuously inspecting the work on the machines, while the duties entailed ~~of~~ in mending have been withdrawn from them.

The incessant walking about the workshop has also been reduced. The workers are supposed not to leave their sectional areas until permission has been accorded them by the charge-hands, and these, in turn, have to obtain the permission of Miss Nolan, who is responsible to the Departmental Head for the work in the workshop. This rule is, however, largely disregarded.

The factory is usually behind in the matter of delivering orders to specified dates, and in order to reduce these delays to a minimum, the heads of departments are continuously performing the duties of 'chaser' in the workshop. At these times they are apt to send the nearest worker to conduct the next enquiry, even if she is already working. This custom has now developed into such a habit, that a worker will leave her machine at the request of even a picker-in. It is not unknown for as many as three workers belonging to one department to be sent within five minutes to the same individual of another department to institute various enquiries.

For the purposes of maintaining the principle, the management should on no account break the order prohibiting workers from leaving their machines. Each case is always considered very important by the management, but in spite of this, we strongly recommend that this order be enforced. If enquiries have to be made, the departmental 'buzzer' should be used, while the material which is required urgently should wait till the next despatch, or it should be obtained by a machine worker who is waiting for work.

To enforce this principle, we strongly advise that the management issue written instructions that no worker should leave her machine unless with the permission of the charge-hand, who in turn, will obtain formal sanction from Miss Nolan. Should a worker be waiting for work, however, and should she desire to wait in the Rest Room, permission must be obtained in the same manner. To recall workers from the Rest Room the staff should use the departmental buzzer - they should not wander down to the Rest Room on the floor below to instruct the worker to return to her machine. We strongly recommend that this rule of prohibiting workers from walking about and taking messages should be enforced with equal rigour in the Finishing Department.

3. Lengths of Garments Knitted.

All garments are made to definite measurements. The stock models are made to definite standard lengths, while private orders always have the required measurements recorded on the costing cards. Since, however, the garment is kept very taut by means of weights while being knitted on the machine, there must be a certain amount of shrinkage back to normal conditions when the garment is taken off the machine. The charge-hands therefore make an allowance for this shrinkage by knitting the garment longer than the specified dimensions. The allowance made, however, has been known to be very excessive on occasions. During the investigation, when this point was under consideration, the charge-hands altered their views of shrinkage considerably, and, on their own initiative, reduced the lengths of garments to be knitted. This resulted in frequent cases where insufficient allowance was made for shrinkage, and the garments had to be picked on the machine again to be lengthened. It was felt that the problem required close investigation, and that there was need for the issuing of definite instructions on this point. Garments of various types of wool were measured in the workshop, and then remeasured a few days after in the Finishing Room to ascertain the amount of shrinkage that occurred. As the result of these measurements a meeting was held and the management decided to reduce the quantity of waste material. To obtain reductions, instructions were then issued that allowances should be made according to the scale given in Appendix VI. On passing these figures as final, the management have permitted the charge-hands more scope for flexibility than we consider necessary. During the period when this point was absorbing the interest of the factory and when the charge-hands were attempting to reduce this waste, records were taken for a few days and these gave the following results.

Ultimate weight of garments.	Necessary waste due to cutting.	Waste.
125 lbs. 7½ ozs.	9 lbs. 3¾ ozs.	
Total Weight 134 lbs 11¼ ozs.		10 lbs 3¼ ozs or 7.57 per cent.

This waste of material corresponds to a money loss of £499. 12. 5 on a yearly expenditure of £6600 on wool for garments. We understand that the demands by the Association are increasing yearly, so that the loss of roughly £500 per annum may tend to increase unless definite steps are taken to preserve greater accuracy in these measurements as already indicated.

One other factor for which the making of superfluous material on garments is responsible is a definite loss in production. If the allowances for the shrinkage of material were reduced to a minimum the workers could utilise on actual production the time now spent on preparing superfluous material. If the ratio of time spent on preparing wasted material to the time spent on knitting the total material is the same as the ratio of material wasted to the total material knitted, there will be an increase in production of 7.57 per cent. at least. In a factory with a yearly turn-over of about £18,000, the additional time available to assist actual production will increase the turn-over by about £1360. Since, then, it is possible to save at least £500 a year by reducing waste of material, and also to increase the annual turn-over by £1360, we strongly recommend that every effort be made to obtain more accurate estimates of the material required for each garment made.

4. Material Wasted by Operators.

In all industrial processes, losses occur due to faulty work, personal errors, etc., but this loss is even greater in a blind factory than in others. Consequently the management in factories employing blind labour have a more difficult problem in minimising this loss. In forty-nine cases taken at random from the costing cards, we discovered that this loss was 9.07 per cent. We consider that this is excessive, although we have no previous records of such losses in an exactly similar factory. Again, assuming that the wool used for preparing garments in a year costs £6,600, the loss by actual blind labour in the workshop wasting material is approximately £600 per annum, or expressed as a daily figure in this department alone, the waste is over £2 per working day When actual waste of material occurs, there is often an indication of some inefficiency on the part of the operators. Some operators are not quite confident of themselves in certain models, or garments and so on. The question of reducing this figure should lie with the charge-hands. When the garment is completed by the operator, the charge-hand weighs the amount of raw material unused, and notes this, with the quantity used, on the costing card. We strongly recommend that the garment be weighed and its weight noted on the card at the same time as the weighing of the wool being returned to the Bobbin Winding Department.

This weight of the garment is usually recorded on receipt of the material in the Finishing Workroom. We consider that this is the wrong point at which to obtain the information if it is to be used in reducing this waste, since the garment has already been passed on to the next department. The information should be obtained at the point where the waste occurs, and we recommend that this additional duty be given to the charge-hands. The figures will then inform charge-hands of those operators who are responsible for excessive waste, and greater attention should then be paid to them until the waste has been considerably reduced. In this manner, not only should the waste of raw material be minimised, but production should increase owing to more efficient methods of working. We are of opinion that any waste beyond half an ounce per pound should be investigated by the charge-hands, and those workers responsible for such waste should be carefully supervised and taught more efficient methods.

5. Grading of Workers.

We recommend that all workers on 10 gauge machines should be in one section, those on 7 and 8 gauge machines on another, and so on. Closer enquiries into this matter after the investigation show that there is a distinct advantage in this arrangement. It is in actual practice at the present moment in Section III where all the workers on 7 - 8 gauge machines are on plain work. There will always be some spare machines of each type, owing to the fact that there should not be too many machines in any particular section. These spare machines of the various gauges could be made to comprise a mixed section; otherwise the remainder of the operators will be graded on quality of work. This will facilitate the duties of the charge-hands of sections, for each one will have fewer types of work to consider than at present, except in the mixed section. All plain work will be knitted under one charge-hand, and she need not be bothered over the many varieties of fresh models etc. performed in the workshop, and so on. We understand that when a number of the good workers were placed in the little room there was an immediate improvement of work with a consequent increase in production. The grading may have been responsible for this improvement, but we recommend that the experiment be tried in the workshop as a whole, if for no other reason than for the simplification of the duties of the charge-hands.

We also recommend that the names of the workers be recorded in the pay book (kept by the Departmental Head) according to sections. It could then be seen at a glance which sections of workers were improving and which were not. Enquiries, too, could be instituted on behalf of individual workers. The information so recorded would also give some indication of the efficiencies of the charge-hands.

6. General Procedure of Work.

In general, the raw material wound on bobbins is received in this department. All bobbins received are weighed, despite the fact that they are weighed before despatch from the Bobbin Winding Department. This duplication of work in departments of the same factory seems undesirable, although it would be inadvisable not to have a check on the preceding department. For two days records were taken; one hundred and seven and one hundred and one bobbins were received, and there were two errors of weight on one day, and only one on the other. In a whole week only four errors of weight were recorded. In view of this, we advocate the cessation of this duplication: weights should, however, be checked every now and then. Large errors of weights are easily observed.

The contents of each consignment of raw material from the Bobbin Winding Department were not always checked on the day of receipt. Discrepancies (including complete bobbins necessary) ~~being reported~~ have sometimes been reported several days after the receipt of the consignment.- Arrangements have now been made to check consignments immediately they are received - within at least half an hour of receipt.

The bobbins with their costing cards are placed on a table ready for the charge-hands. After the garment has been knitted, the weight of the garment should be noted on the costing card, as suggested on page 19, together with the amount of wool being returned to the Bobbin Winding Department. From this, the quantity of wool used is also recorded on the card. The garment with its card is then sent to the mender, and from her to the two inspectors.

After weighing the bobbin containing the wool etc. to be returned to the Bobbin Winding Department, the quantity is recorded on the docket form, which is again placed on the bobbin. The bobbin is then placed in a large basket provided for this purpose, while there is another basket provided for empty bobbins. At definite periods, bobbins are taken from these baskets, placed in smaller portable ones, and taken to the Bobbin Winding Department.

This process seems unsatisfactory for two reasons - it introduces unnecesarry double - handling, and it tends to soil the material, which may be responsible for 'shady work'.

We recommend that a few more baskets similar in size to the portable type be provided. When baskets containing material from the Bobbin Winding Department are emptied, they may be filled with empty bobbins, and with those bobbins on which material is being returned. Empty bobbins should always be kept separate from the others. The baskets will then be in continuous circulation, and the objections mentioned above will no longer apply.

We understand that this was the practice years ago, but that the baskets for this purpose were always being purloined. To prevent this, we recommend that all the baskets for this purpose be numbered and that the number be written in large figures on at least two sides of each basket. If such a basket is utilised for any other purpose, the user should be reprimanded and ordered to return the basket.

It was the practice of the two inspectors to accumulate material, and then to take it down after examination to the next floor - the Finishing Workroom. Here again, we found that operators were encouraged to perform messenger duties et Recently, however, this has been discontinued. The inspectors now remain at their work, while the men who carry the raw material from the Bobbin Winding Department now take the garments from the inspectors to the Finishing Workroom at regular periods. This arrangement has been considered most satisfactory.

Before leaving the workshop, however, a detailed record of the model number etc. is prepared and accompanies these issues to the Finishing Workroom. Instances have occurred when responsible members of the staff have taken complete orders out of the workshop when no such record has been made of them. When this occurs another member of the staff has to make a harassing search for this order in the workshop. Since no record has been made of its issue, great efforts are made to determine where it is, and most of the officials of the workshop are 'chased'. We do not consider that officials from any one department are to blame for taking garments without an entry being made and for causing these vain searches later; but the prevention lies entirely with the workshop management. On no account should any garment leave the workshop without a record being made in the issue book. We consider that strict instructions should be given to the entire staff on this point.

To comply with an order, several pieces of material are necessary, and some workers in the Finishing Workroom find it difficult to know how many pieces should accompany each order - particularly when it deals with new models. When the order has passed through the several processes of the Finishing Workroom, it is discovered suddenly that there is a piece or two missing - pockets or trimmings, etc. This happens frequently. Immediately the workshop is accused of having sent down the order short, and further delay ensues either in finding the missing piece or in having it remade. To prevent any accusations being levelled at the workshop for such discrepancies, the inspectors must ensure that the number of pieces being despatched with the order is noted on the top right hand corner of the costing card. Once the order has passed the first process in the Finishing Workroom, all complaints of shortages must be referred to that department.

7. Raw Material for the Round Machines.

All types of hosiery are prepared on the round machines.

A noticeable feature of the work on these machines was that the operators appeared to be winding wool for the major portion of the day. On enquiry, it was discovered that when the wool was wound by the Bobbin Winding Department on the pound or large bobbin - and it was customary to wind on this size of bobbin - the bobbin was too large to fit in with the work on the round machines. Consequently, the operators on these machines had to wind from the large bobbins on to smaller ones. These difficulties on the round machines were not explained to the Bobbin Winding Department until recently. Wool is now to be wound by the Bobbin Winding Department on half-pound bobbins, and this will permit the operators on the round machines to remain on actual production.

One of the 're-winders' has now been taught to wind doubly to the satisfaction of the workers on the round machines. (Double winding consists of winding two threads on the same bobbin.) In such cases, the wool should be supplied by the Bobbin Winding Department, and not wound on to bobbins by them. So that, for all types of hosiery, the round machines are fed satisfactorily and can be kept in operation continuously. The wages of the workers on these machines have increased from approximately 12/6 to 19/- per week - an increase of 52 per cent.

From the 1st April to 31st December, 1929, hosiery containing 319 lbs. of wool was prepared on these machines, or, on a pro rata basis, 425.3 lbs. of wool were wound by the operators of these machines in a year. It requires approximately forty minutes to wind one pound of wool by hand, so that with a working week of forty-four hours, it required 6½ weeks to wind the 425.3 lbs. of wool. With the new arrangements, this period can now be utilised on full production.

8. Piece Rates.

Each charge-hand had a booklet in which she recorded all the piece-rates. The care and order with which these booklets were kept depended upon the character of the individual. The booklets were not scrutinised by the head of the department at definite intervals. If a fresh piece-rate was determined for a new model, verbal instructions were issued. Despite this fact, exceptionally few discrepancies in the price have been discovered between the various charge-hands. There are however, objections to this method due to

i. the issuing of verbal instructions,
ii. the recording of a large list of piece-rates in a booklet,
iii. the difficulties experienced by a new charge-hand, and
iv. the absence of a check of entries made on the costing card by the Accounts Department.

In dealing with the first grounds of objection, we feel sure that the management do not need any further explanation. It is imperative that the office of the head of the department should have a record of all piece-rates in existence, and of others as they are determined.

A booklet containing a large list of piece-rates in which the entries have not been made in any orderly manner, often demands careful scrutiny before the particular piece-rate is discovered.

The difficulty experienced by a new charge-hand who has to keep enquiring for each piece-rate until her booklet is complete can well be imagined.

With the last objection, no matter what entry is made by the charge-hand on the costing card, there can be no check by the Accounts Department. If such a check were possible, the discrepancies of the different piece-rates would have been discovered by that department.

In view of these objections, the piece-rates from all the charge-hands have been collated to form one complete list. This list, which is given in Appendix VII, has been so prepared that the models have been grouped separately. All models of one piece garments are together, those of two piece garments are separated from those of three piece garments, and so on. Each of these divisions have been dealt with in the numerical order of the model number. Copies of this list were given to each charge-hand, while one was maintained in the office of the departmental head. We strongly recommend that a copy be used by the Accounts Department as a check against the entries made on the costing cards.

9. Waste Placed in Bags on Machines.

The waste made by the operators was usually thrown on the floor, and gave a very untidy appearance to the workshop. Small bags have been made and tied on to some of the machines, in an accessible position, and waste is now being placed in them. So far, only workers in two sections have been provided with these bags, but they are on order for the remaining workers.

Collection of waste material in this manner will facilitate selecting it from other wastes found on the floor. A nominal price is obtained in the sale of waste wool.

10. Cleaning of Machines.

All machines were cleaned by hand. To clean a machine completely requires about four hours. Since a number of machines cannot be spared for this length of time, a period of from six months to a year often lapses before some of them are cleaned. A Sturtevant Vacuum Cleaner has now been purchased, and, after a machine has been thoroughly cleaned by hand, the use of this cleaner every three weeks will prevent the accumulation of dirt and grease on the machine. A machine can be cleaned by the vacuum in about fifteen minutes. On account of the short period required to clean a machine, arrangements can easily be made to clean all the machines in the workshop once every three weeks. By maintaining a high state of cleanliness in the machines, the management will facilitate production. No systematic method of cleaning has yet been adopted. We suggest that a whole week be allotted for cleaning the machines in sections I and II, another for sections IV and V and a third for section III: all machines will then be cleaned once every three weeks.

The Sturtevant Vacuum Cleaner can be used for several other purposes, such as cleaning the floors and walls of the building. It is now being used for this purpose and has disposed of the services of a charwoman at £52 per year. The vacuum cleaner cost approximately £80.

11. Ventilation.

We understand that the floor of the present workshop was originally the roof of the building. When the addition to the building was made, the need for adequate ventilation was not given proper consideration. The windows for this floor are really the tops of the windows for the floor below: consequently the windows only stand four feet above floor level in the large workroom. The small workroom is not considered, as ample ventilation and daylight are provided in this room. The atmosphere in the large workroom, however, even during the winter months, was 'close' and not conducive to work. In the summer, we understand, the conditions are "somewhat stifling". In addition to these discomforts, the workers have to contend with the hot cooking vapours from the kitchen (belonging to the canteen) in the basement. Since there is no outlet for these vapours, they gradually creep up to the workroom, and make conditions even more difficult for the workers.

There is one opening in this building for extracting the air and for making the conditions more conducive to working. This is a circular hole, approximately two feet in diameter, on the south wall, very near the roof of the building. Katathermometer readings were taken in varying positions in the room and none of these gave a reading higher than 3. Any readings below 5 show that conditions for the purposes of factory work are distinctly poor: 6 is considered good. The operators are therefore working under conditions far from ideal . The introduction of an extraction fan or two would tend to produce better working conditions. We would strongly advocate the Sturtevant Company be approached with a view to installing extraction fans before the oppressive summer conditions actually arrive.

12. Artificial Illumination.

Local Lighting. For the purposes of assisting the picker-in in examining the work in detail on the machine, a bulb (without reflector) on a flex was provided. The flex, however, was far too short for the bulb to be used on every machine in the room. In addition, if the light was required for machines in the two centre rows, it was necessary for one operator to keep warning other workers to beware of the lead, which had been drawn across their pathway. The light was held by another worker, so as to permit the picker-in to employ both hands on her work. For machines along the wall, but at some distance from the plug (in the wall), care had to be taken that the lead did not interfere with work on the intervening machines - the machines, that is, between the machine being attended to and the plug in the wall. The troubles and difficulties caused by these methods often led to pickers-in attempting to work without the use of any direct light.

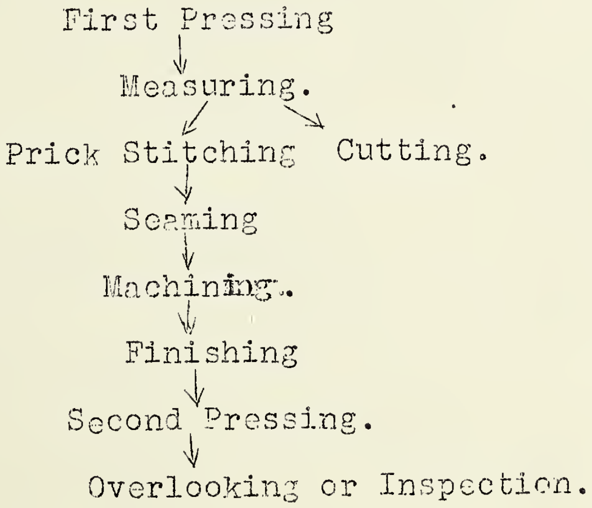
During the period of the investigation, several local intense reflectors were experimented with, and on the grounds of actual experience gained, we recommend that four reflectors of the A.I.100 type (from Messrs. Holophane & C. Ltd.) with 100-watt bulbs be used for this purpose. A long rod or bar should run down the length of the room immediately over each of the four rows of machines. A plug should be placed at the end of each bar with sufficient lead for the light to reach the end machine of the row. To prevent the lead from sagging, we suggest that rings be placed round the rod, and that the lead be passed through them. The plug should be continuously inserted, but the switching on or off the light should be performed at the bulb by a 'push and pull' contact. The light should hang three feet six inches above the machine. This will permit it to pass above the accessory parts of all the machines, and yet the light will completely illuminate all the needles on the machines.

IV. FINISHING WORKROOM.

The material received from the workshop is immediately weighed here. In view of our recommendation on page 19 that the garments be weighed before leaving the workshop, there will be no necessity for any weighing to be performed at this stage.

All the workers in this room are completely sighted.

The garments then go through a sequence of processes as shown in the following diagram.



Despite the fact that the orders go through the above processes in sequence, we find in actual practice that the orders are broken up, so that several workers on the same process may be attending to garments of the same order. This method tends to cause 'chasing' of the various garments, in order to collect the whole order, and losses of small portions of the order, due to these portions being mislaid. These points have been explained to the departmental head, who has agreed to adopt the procedure that every worker will attend to each order in its entirety, whether it is a one, two or three piece garment.

No records of output of each process had previously been obtained: it was therefore difficult to state which processes were adequately staffed and which were not. Here again, the number of workers carrying garments and conveying messages was a noticeable feature. Should messengers be required they should be employed, but on no account should workers on specific processes be used for this purpose.

The organisation of this department should not be difficult since the processes are in sequence, except at one stage. The output of each individual in this department is now being recorded. We suggest, for purposes of rough comparison, that the unit of output be considered in pieces, i.e. a jumper, coat, skirt or a cardigan. For example an order for a one piece garment will be considered as one garment, an order for a two piece garment will be considered as two garments, and so on. In this manner some standards of comparison can be made. Once the output has been obtained for at least a fortnight, more accurate methods of balancing the various processes can be made than are at present in existence. Still finer adjustments can be made if it is discovered that the number of girls employed on a process is identical or in a definite multiple ratio with the number employed on the process immediately preceding it. Then arrangements could be made for one particular girl of one process to 'feed' a particular girl of the successive process with material, and so on. This method would have the advantage of making it exceptionally easy to trace which particular operator of any process worked on any definite order. We recommend that every effort be made to obtain a systematic balancing of these processes.

1. Loss of Garments.

Losses frequently occur in this department. They are usually small oddments of the garments such as pockets etc., and they are generally 'placed' at the door of the Workshop. When a loss occurred, it was usually a safe plan for the worker to say she had not received it, and that, in all probability, the worksho had omitted to send it down. These losses have been numerous, and are responsible for delays in supplying some of the orders on the dates promised, as well as for the loss of material and time already spent on the garment. In view of the new procedure in the workshop (each costing card will have the number of pieces of the order inscribed on it) we recommend that the operator of each process should make a check, when beginning fresh work. If an operator draws the attention of the charge-hand to a shortage, the operator on the previous process, should then be held responsible for the loss, and appropriate action can then be taken. In this manner, a complete check of the pieces of orders throughout the workroom will be ensured, and there should be no further losses of parts of garments and delays in the completion of orders. This mode of procedure has been explained to the departmental head, but we consider that workers should be informed of its introduction.

2. Piece-rates.

All the operations in this department except finishing are paid on time-rates. The finishing process is the only one on which a piece-rate is paid. A copy of the piece-rate for this process is given in Appendix VIII. From it, piece-rates for an entire model are determined. A list of the piece-rates for each model should be prepared, and a copy retained in the Accounts Department for purposes of checking the costing cards.

3. Artificial Illumination.

The processes of finishing and prick-stitching required very minute and careful work. In observing the positions of the workers, it was felt that some of the girls were not receiving as much assistance by artificial illumination as some of the others. Readings taken by the lumeter substantiated these observations. After various types of reflectors were experimented with, it was decided to obtain a better distribution of light round the table. It would be necessary to use two 60-watt frosted bulbs with N.R.3

reflectors (from Messrs. Philips Lamps Ltd.) over each table at a height of approximately eighteen inches above the table. Although this will increase the wattage for those five tables from a total of 460 watts to 600, we feel sure that the resultant beneficial effects on the workers will more than compensate for this increased expenditure. We recommend that these lights be installed before the autumn. A plan giving the lumeter readings and the positions of the lights recommended will be found in Appendix IX. It would greatly assist in obtaining better lighting if the ceiling, the south wall and the outside of the cubicles were painted white. We recommend that this be done at the next spring cleaning.

V. PLANNING.

In dealing with a factory containing many sequences of processes and varying types of machinery, it is always necessary to know the actual capabilities of output of each machine and of each process, in order that the orders put through for the day's programme of work is neither too low nor too extensive. If either of these conditions are found to exist, financial loss always follows.

With this factory, orders[1] are received and immediately commenced upon. The capacity of output of each department is unknown. If the orders received are in excess of the works capacity one day, and the next day they are considerably lower, the management hope that in the end the two will balance. It is only when numerous orders are waiting to be completed that the management realise that more plant of any one type is necessary. This method of determining whether the factory can cope with the orders received is very inadequate, and it gives information of faulty planning only when orders are in excess and cannot be supplied by the promised delivery dates. It does not show whether any of the processes are capable of producing more than the amount ordered.

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[1] We refer only to orders for general work on the major types of machines in the workshop - those of 18 gauge, purl and jacquard have all been omitted.

When the output of each department is known, the planner can arrange to staff the processes so that at no particular point will there be a lack of balance between one process and another. Also, in most Works, the output is usually constricted at one particular process. In this factory the output is limited by the number of knitting machines.

Information is given in Appendix X of the weekly capabilities of output of the 7, 8 and 10 gauge machines. Throughout the period during which these records were extracted, all the 7 and 8 gauge machines were not fully occupied, but since we know the number of machines which were idle per half day, the capabilities of output on these machines can be roughly determined. The 10 gauge machines were fully employed. These capabilities, placed on a weekly basis, are as follows.

	week ending				
	15/3	22/3	29/3	5/4	average.
Output per 7 gauge machine per week	94.82 ozs	105.16	84.94	99.22	96.03 oz.
" " 8 " " " "	67.76	65.67	70.84	88.33	73.15 "
" " 10 " " " "	173.07	176.44	215.05[1]	157.52	169.00 "

The planner could arrange a regular flow of work if he was placed in the Knitting Workshop, and if all costing cards were passed to him after the departmental head had noted the demand for wool and the type of machine on which the garment is to be made. He could also determine, with the quantity of orders being received, how much he is in arrears at any given moment. If he has not sufficient orders to keep his machines busy, he should inform the Factory Manager (in writing) each day by how many pounds of material he is below capacity. This could then be made up by preparing garments for stock. If orders are received in excess of capacity he should hold up the excess orders for that day but they should be the first to be worked upon the next day. Should the factory get into arrears on any type of machine, the matter could be brought to the notice of the Factory Manager, who would then make arrangements either for the refusal of further orders on these machines or for the purchase of additional machines.

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[1] 50 hour week. NOT included in average figure.

From Appendix X we note that for a period of four weeks, orders to the extent of 128 lbs. - 9 ozs. of material were received.in excess of 10 gauge machine capacity. (This is given by the difference between columns of 2 and 4.) There is clearly a need for additional machines of this type. The exact number required is difficult to determine, for, in viewing the receipt of orders, we notice that one week the demand fell much short of the factory capacity. There would, however, appear to be need for at least three additional machines, and we recommend that the machines be purchased as soon as possible, in order to permit the factory to cope with its orders. Orders for work on the 12 gauge, Purl and Jacquard machines appear to be in excess of the capacity of these machines, owing to the number of orders pending in the factory.

Another great advantage to be gained by the introduction of a planner is that a regular quantity of work will flow through the Factory. It would prevent the rush periods, during which working conditions tend to become chaotic.

The greatest advantage to be gained, however, is that it will permit the factory to supply on promised delivery dates. A fortnight is the period usually allowed for a garment to be completed, and even this has frequently been found to be far too short. Some timings have been taken to determine the period required to knit garments, and from them (Appendix XI) it will be noticed that no garment required more than two days. If a day is allowed for the period between the receipt of an order in the factory and the time taken to commence working upon it, and

1 day is allowed to wind on bobbins,

2 days are allowed to knit and inspect,

1½ days are allowed to finish, and

1 day is allowed to permit of any overlapping, etc.,

We find that the greatest time required to complete an order is 7½ working days.

Planning will thus be of great benefit to the factory for the following reasons.

i. Output of processes known.

ii. Balancing of the processes - this is of very great economic value.

iii. Exact requirements of additional plant.

iv. Arrangement for a regular flow of work.

v. Tendency to reduce the period of time required to complete an order, 7½ working days being the very longest period.

vi. Complying with orders to delivery dates.

In mentioning the last reason, we are of opinion that the supplying of orders to delivery dates will increase the number of orders received by the Association.

VI. SALES.

On enquiry into this side of the business, we find that garments made in the factory are sold at the showroom on the first floor, at the shop in Kensington, and by the aid of the travellers. There are, of course, other indirect methods used, such as advertising and displays at exhibitions.

The staff employed in the three departments mentioned above devote the whole of their attention to the actual sale of garments. No definite records are collected, however, either by them or by a centralised department, of the numbers of each model sold per week or per month. Nor are any records kept of the profit or loss made on each type of model. It is on this information mainly that sales departments should concentrate, the complete details being given to the whole selling force so that they may know which particular models should be 'pushed' and which should not. We are of opinion that this information should be obtained and that the sales staff should be given definite instructions on to which models they should concentrate their selling forces.

Further, bi-annual sales are held in January and July of each year, both at the shop in Kensington and at the showroom. At these sales, prices of all the old models in stock in these shops are reduced. Information is not available to show whether or not it is worth making stock to be sold in the bi-annual sales at a reduced figure. Examination of the graphs in Appendix XII of the turn-over for 1928 and 1929 show a definite decline for the months of July, August and September, despite the fact that a sale was held throughout the month of July. Apparently the sale is not of much assistance in increasing the turn-over. We are of opinion that, rather than resorting to sales at definite periods of the year, more information should be obtained as to the profit or loss made on each type of model, and the number of models sold per month. Of seventy-two cases at random from the Costings Book of models costing more than twenty-five shillings per model, forty-seven or 65.3 per cent. were sold at a profit, All the expensive models are knitted on the 10 and 12 gauge, purl and Jacquard machines. We are of opinion that the records would indicate that work on these machines tends to yield a profit, and that if more work was concentrated on these machines, the factory would then be able to produce at a profit - a situation not yet attained in any blind knitting factory in the country. We feel that this is within the grasp of the London Association for the Blind, and that every effort should be made to attain it.

1. Show Room.

The room allocated for this purpose was well chosen, as far as obtaining the full advantage of day-light is concerned. It is on the first floor and is fairly bright owing to its two large windows. The room is lit by 'daylight' bulbs, some of 100 watts and others of 150 watts. This is an expensive method of lighting a room. In addition, the bulbs are shaded by paper lamp shades, so that the absorption of the light is excessive, while there is no compensatory effect by decoration. In a room where sales are being conducted, it is imperative that every effort should be made to make the room attractive. One of the methods usually adopted is to concentrate on methods of lighting. If these 'daylight' bulbs were replaced by four 200-watt bulbs with crystolite bowl fitting (plain type) similar to those supplied by Messrs. Holophane & Co., we are of opinion that the lighting of the room would be much more effective. For the purposes of comparing shades of colour as they will appear in the sunlight, we recommend that a daylight bulb be used; this can be switched off when not required. We also recommend that the switches for the main lights be run off in pairs, the two lights by the windows being on one switch and the remaining lights in the room on another switch.

We also consider that the door marked X in the plan of the showroom (Appendix IX) should be painted a light colour to blend with the colour scheme of the room.

A very important factor in a saleroom is its entrance. The main door leading into the room has a very drab appearance. We recommend that the door be painted on the outside in order to make it look more attactive.

VII. MISCELLANEOUS.

1. Canteen Kitchen.

Reference has been made to the smell of cooking emanating from the Canteen Kitchen and permeating the workshop. Following an inspection of the Kitchen we consider that if cowls were placed directly over the stoves, with ducts leading to the open air, this defect would be eliminated, with beneficial results both for the canteen and for the workshop staff.

2. Costings Department.

Since all piece rates are to be known in the Costings Department, a check can now be made against the costings cards. At the moment no check is made, but a copy is made in the book of all the entries on the cards. There are always two entries on the card of piece rates - one for the knitter and one for the finisher - and these are entered separately in the book. Only one entry - the total of these two piece rates-need be made. This will save the clerk a considerable amount of time in maintaining this register.

VIII. GENERAL CONCLUSIONS AND ACKNOWLEDGMENTS.

In various sections of this Report we have drawn attention to the waste of material which occurs in production. The extent of this loss and the points at which reductions might be effected are indicated in the following table which gives the amount of wool wound to knit garments of 100 lbs. in weight.

To knit garment of 100 lbs. weight.

Necessary waste on garment for purposes of shaping	107.361lbs.	
Unnecessary waste is 7.57 per cent. and this figure is low (Longer Garments)	115.5 "	(Loss of £500 p.a. and (Increase in turnover of (£1382.12.0 p.m.
Waste Material by knitters 9.07 per cent	125.98 "	Loss of £600 p.a.
Demands of raw material in excess of requirements 23.57 per cent.	157.29 "	Unproductive time spent on winding large 'returns'.

So that, to obtain knitted garments of 100 lbs. weight, raw material of 157 lbs. is wound.

We are convinced that now these figures have been placed before the factory, every effort will be made to affect all possible savings.

Throughout the factory a spirit of good feeling exists and management and workers are always ready to perform additional duties on behalf of the Association. Each individual recognises that it is the London Association for the Blind which is of first importance. We are convinced therefore that this Association possesses management and workers capable of making it the first blind factory which will produce a net profit in the knitting industry. Apart from the possible savings and the increase in turnover which can be effected, the introduction of a planner will greatly assist the factory to attain this profit. The planner will also help the factory to reduce the time required to complete a garment and to obtain the reputation of being able to deliver by the date promised - a long felt want.

In conclusion we would like to express our thanks for all the facilities afforded our investigator by Captain G.P.Pollard, by Miss A. M. Burrow, the Factory Manager, and by the entire staff, who so thoroughly co-operated with us in our work.

(Signed) G. H. Miles.
For Director.

9th May, 1930.

APPENDIX I.

DAILY ISSUES FROM THE BOBBIN WINDING DEPARTMENT.

Date.	Quantity. lbs.	ozs.
6/1/1930	117	0½
7/1/1930	115	9½
8/1/1930	187	14½
9/1/1930	83	0
10/1/1930	85	0
11/1/1930	24	0½
	612 lbs.	9 ozs.
13/1/1930	97	2½
14/1/1930	117	5½
15/1/1930	108	14
16/1/1930	83	14
17/1/1930	191	4
18/1/1930	78	6
	676 lbs.	14 ozs.
20/1/1930	56	13½
21/1/1930	99	14
22/1/1930	101	13
23/1/1930	93	15½
24/1/1930	106	2
25/1/1930	13	1½
	471 lbs.	11½ ozs.
27/1/1930	44	10
28/1/1930	185	12½
29/1/1930	168	6
30/1/1930	61	13½
31/1/1930	117	11½
1/2/1930	45	12
	624 lbs.	1½ ozs.

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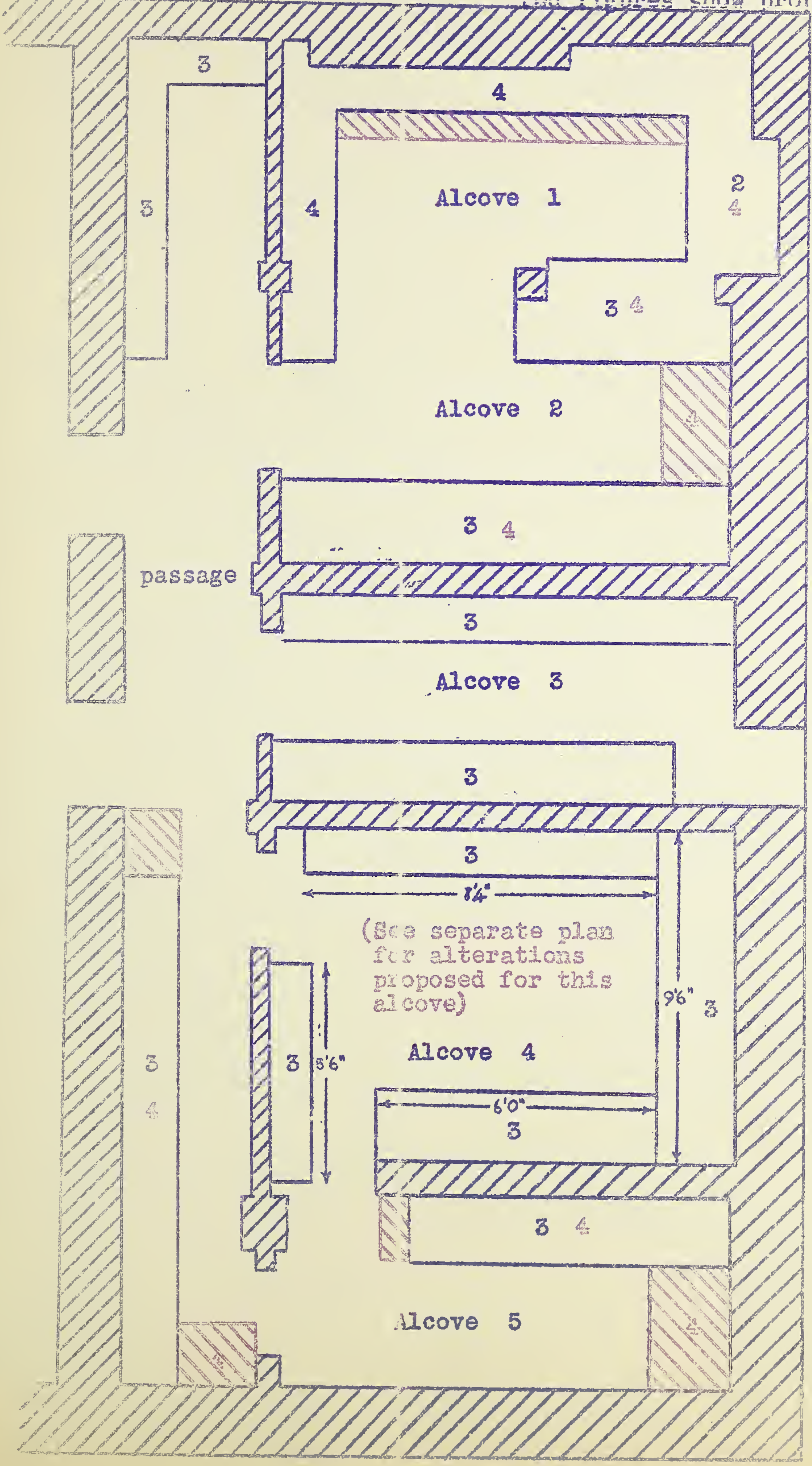
APPENDIX II

GROUND PLAN OF WOOL STORES IN BASEMENT , ROSEDALE HOUSE.

▨ showing proposed additions and extensions to existing rack space.

Blue figures indicate number of shelves at present in each rack, red figures show proposed additions



(Scale ¼"=1')

N.I.I.P. E.J.R.

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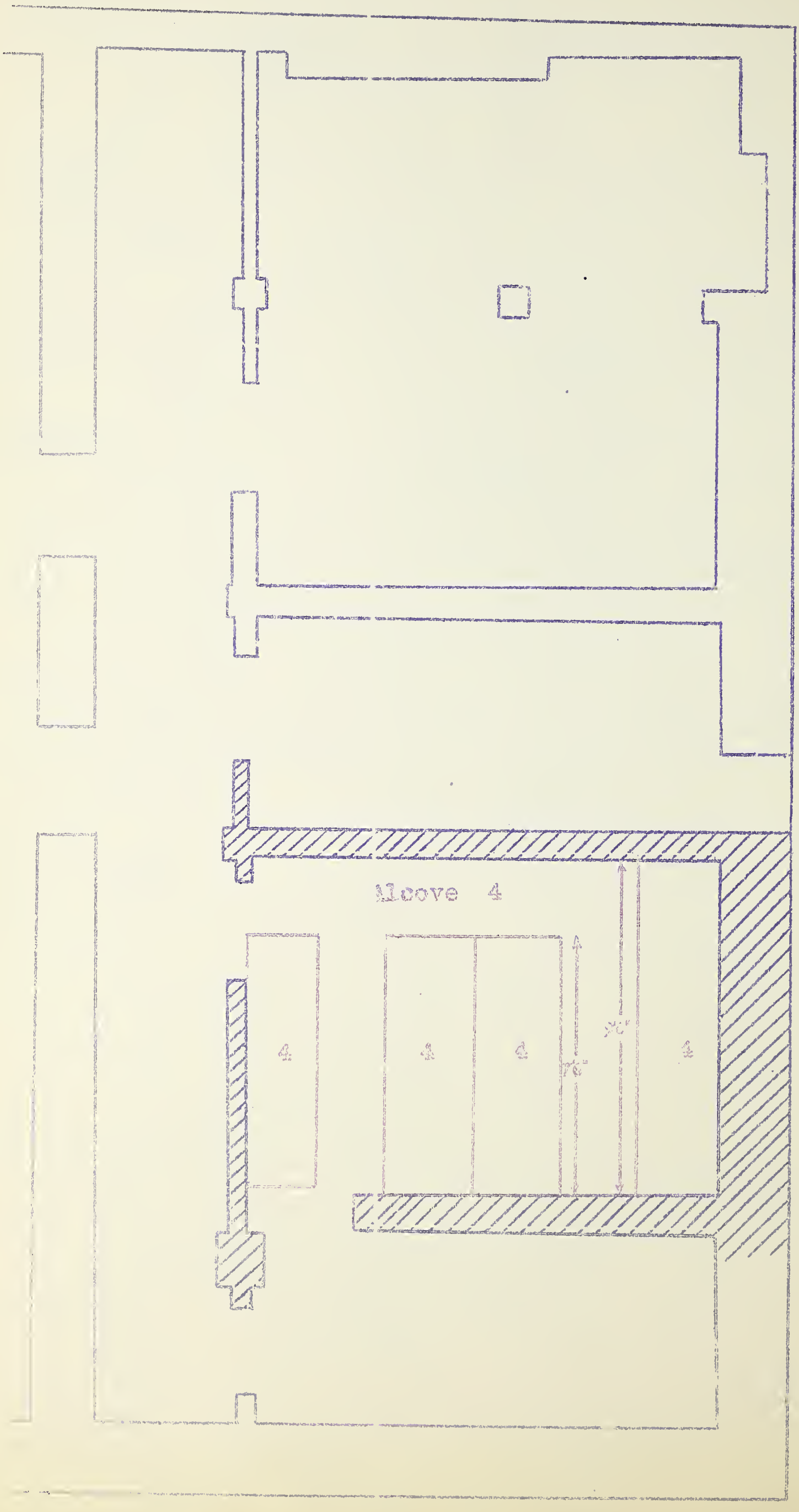
APPENDIX III

PLAN OF ALCOVE 4 OF STORES (Scale ¼" =1')



N.I.I.P. E.J.R.

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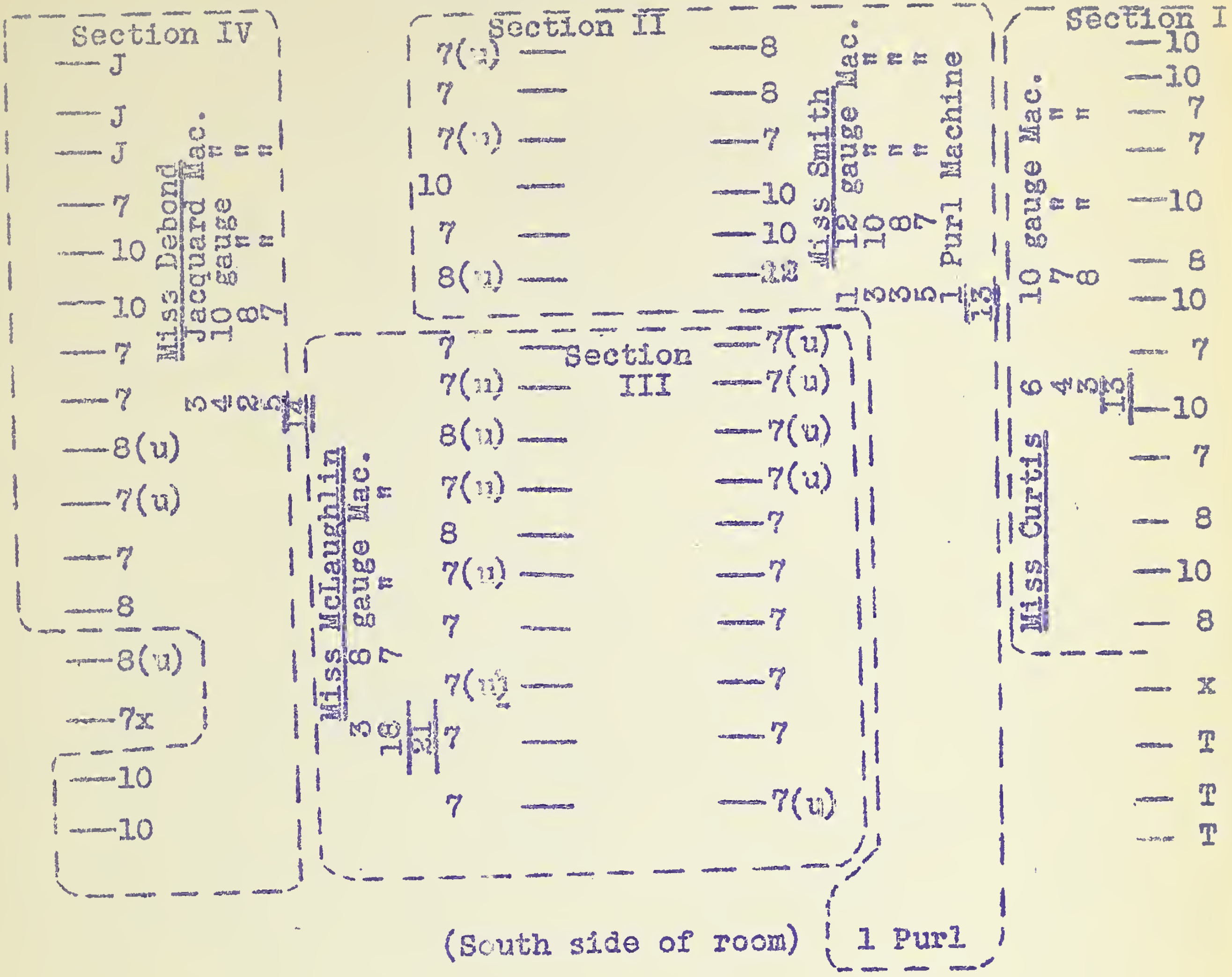
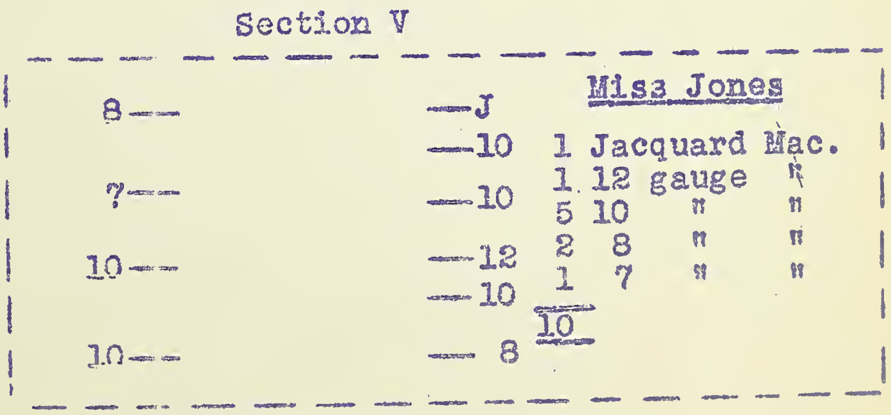
APPENDIX IV

PLAN OF MACHINES IN SECTIONS IN WORKSHOP

Large Room (North side)



Small Room



x	Machine not used
T	Trimming machine
J	Jacquard Machine
u	Worker of machine on unemployment benefit

APPENDIX V.

WAGE EARNINGS (PER WEEK) OF EXPERIMENTAL SECTION.

Names.	week ending 29/1.	5/2.	12/2.	19/2.	26/2.	5/3.
Emma Aaron (7)	2/6	7/3	7/3	11/3	10/-	10/-
Hettie Whale (7)	8/-	14/6	13/9	15/3	17/3	18/-
Dorothy Oldfield (7)	5/-	10/3	6/9	7/9	35/-	15/6
✗ Florrie Schofield (10)	35/1	37/6	38/-	28/6	33/6	42/-
Ethel Baldry (7)	7/6	12/-	17/6	12/8	14/2	12/10
✗ Daisy Roycroft (10)	36/6	40/2	41/-	39/10	43/-	42/11
Alice Brockwell (7)	5/2	12/3	10/9	18/9	12/6	12/-
✗ Mildred Peeling (J)	34/-	29/9	33/6	31/6	33/-	40/-
✗ Phyllis Robins (J)	6/6	26/4	11/6	15/-	21/3	26/10
✗ Kate Cole (7 but producing work of 10)	31/6	28/-	26/10	21/10	30/-	30/8
Agnes Nesbitt (7)	2/6	12/3	16/7	12/-	11/6	12/7
✗ Cora Meadows (12)	23/1	18/6	21/3	15/6	14/6	20/9
	193/4	248/9	244/3	229/10	262/8	284/1

Figure in brackets indicates type of machine.

APPENDIX VI.

SHRINKAGE ALLOWANCE.

Tweeds.

Lengths of garments.	Shrinkage allowance.
From 20 to 30 inches	2½ to 3 inches.
" 31 " 40 "	3½ " 4 "
" 41 " 50 "	4½ " 5 "

200 Wools.

All sizes.	2 inches - except when garment required brushing. This has yet to be standardised.

500 Wools.

From 20 to 30 inches.	2 to 2½ inches.
" 31 " 40 "	3 " 3½ "
" 41 " 50 "	4 " 4½ "

500 and 900 Wools (combined)

All sizes	1 to 1½ inches.

APPENDIX VII.

PIECE-RATES EXISTING IN WORKSHOP.

ONE PIECE GARMENTS.

Cardigans.

1307	2. 6.
1307 O.S.	2. 9.
1171 Plated	5. 0.
1174 Purl	4. 3.
1299	2. 3.
1299 O.S.	2. 6.
1299 Men's	2. 6.
2092 Men's	2. 6.
2108 Plated	6. 6.
2133 10 Gauge	3. 0.
2144	2. 6.
2145 10 Gauge	3. 6.
2145 Striped 4 colours	5. 6.
2145 Plain	2. 9.
2160 Plated	9. 0.
2162 Plated	3. 0.
2300	2. 9.
Plain	2. 9.
Plain Men's	2. 3.
Ordinary with sleeves, Purl	2. 4.
Ordinary w/t sleeves, Purl	2. 0.

Jumpers.

225 Sleeveless	3. 3.
225 With sleeves	4. 6.
1174 Purl	2. 0.
1174 Purl, plated	3. 6.
1190 Purl	3. 6.
1198 Purl, Angora	2. 9.
1469 Purl, plated	3. 6.
1482 Purl	3. 6.
2000	3. 0.
2003	3. 0.
2095	4. 6.
2160 Plated	9. 0.
2162 Plated	3. 0.
2203	5. 0.
2210	4. 6.
2302	3. 0.
2306 Purl	3. 6.
2308	3. 6.
Plain	3. 0.
Striped	3. 3. & 3. 6.

Bridge Coats.

1380 With sleeves	4. 6.
1400 Without sleeves	3. 6.
2201 With sleeves	4. 6.

Dresses.

839	5. 9.
860	6. 0.
864	10. 0.
869	7. 0.
873	7. 0.
874	7. 0.
875	6. 0.
876	6. 0.

Skirts.

583 Pleated	3. 0.
Plain 10 Gauge	2. 0.
Plain 7 & 8 Gauge	1. 6.
With ribbed top	1. 9.
12 & 2 ribbed top	2. 0.
Pleated	2. 6.

Loose Knit Waistcoats.

1293 Sleeveless	1. 3.
1293 With sleeves	2. 0.
1300 Sleeveless	1. 3.
1300 With sleeves	2. 0.
2017	1. 3.
2018	1. 4.
2043	1. 3.
2080	2. 0.
2083	2. 0.
2084	2. 0.
2085	2. 0.
2088	2. 0.
2096	1. 4.
2119	1. 3.
2120	1. 3.
2123	1. 3.
2126	1. 3.

Dressing Gowns,

1959	4. 6.

APPENDIX VII (Contd.).

Jumpers or Cardigans, Jacquard.

726	6. 3.
736	6. 6.
1136	6. 3.
1173	6. 3.
2054	4. 6.
2153	4. 6.
2154	4. 6.
2157	5. 0.
2163	5. 0.
2209	4. 6.

Tennis Coats.

1393	3. 6.
1394	3. 6.
1395	3. 6.
1396	5. 5.
1397	5. 0.
2210	4. 6.

Pullovers.

1152 Boy's striped	2. 2.
1159 Men's	3. 6.
1189 Men's	2. 6.

TWO PIECE GARMENTS.

Jumper Suits.

201	7. 6.
202	7. 0.
204	8. 0.
205	8. 0.
206	7. 6.
207	8. 0.
209 10 Gauge, plated	8. 0.
211	9. 0.
213 10 Gauge, plated	8. 6.
218 10 Gauge, plated	6. 6.
222	6. 0.
226	7. 9.
234	8. 0.
533 Plated	7. 6.
681 Plated	8. 0.
691	6. 0.
734	6. 3.
735	5. 6.
759	7. 6.
761	7. 0.
765	8. 6.
766	8. 6.
773	6. 0.
774	6. 0.
775 Plated	8. 0.
776	7. 6.
778	8. 0.
779 Plated	5. 9.
780	6. 9.
781	8. 6.
782	7. 0.

784	8. 0.
786	5. 6.
787	6. 8.
789 Plated	10. 0.
790 Plated	12. 0.
791 Plated	12. 0.
792	7. 0.
795	8. 0.
799	8. 0.
364	10. 0.
1483	5. 6.
1500	6. 0.
1712 Child's	4. 0.
1719 Large	5. 0.
2303	5. 0.

Coat & Skirt.

63 Tweed	5. 6.
64 Tweed	6. 0.

APPENDIX VII (Contd.).

THREE PIECE GARMENTS.

Cardigan, Jumper & Skirt.

1465	10. 0.
1477	8. 0.
1479	14. 9.
1480	7. 6.
1487 Silk	9. 6.
1487 Wool	8. 0.
1488 Cardigan, Skirt & trimmings only	6. 6.
1488 Jumper without trimmings only	6. 3.
1491	11. 6.
1498	8. 6.
1500	9. 0.
1506	8. 6.
1508	13. 0.

ODDMENTS.

Scarfs.

Plain	6d.
Striped at ends	8d.
Striped all through	1. 0.

Jerseys.

1n& 2 years	6d.
3 years	7d.
4 years	8d.
5 years	9d.
6 years	10d.
7 years	11d.
8 & 9 years	1. 0.
10 years	1. 1.
11 years	1. 2.

Hose.

Plain half hose	8d.
Mixture half hose	8d.
Ribbed half hose	9d.
Ribbed Ladies' hose	1. 0.
Plain Ladies' hose	10d.
Golf hose without tops	1. 0.
Golf hose tops	2d.

Ladies' Knickers.

With 1 gusset	1. 6.
With 2 gussets	2. 0.

Jersey Knickers.

All sizes	6d.

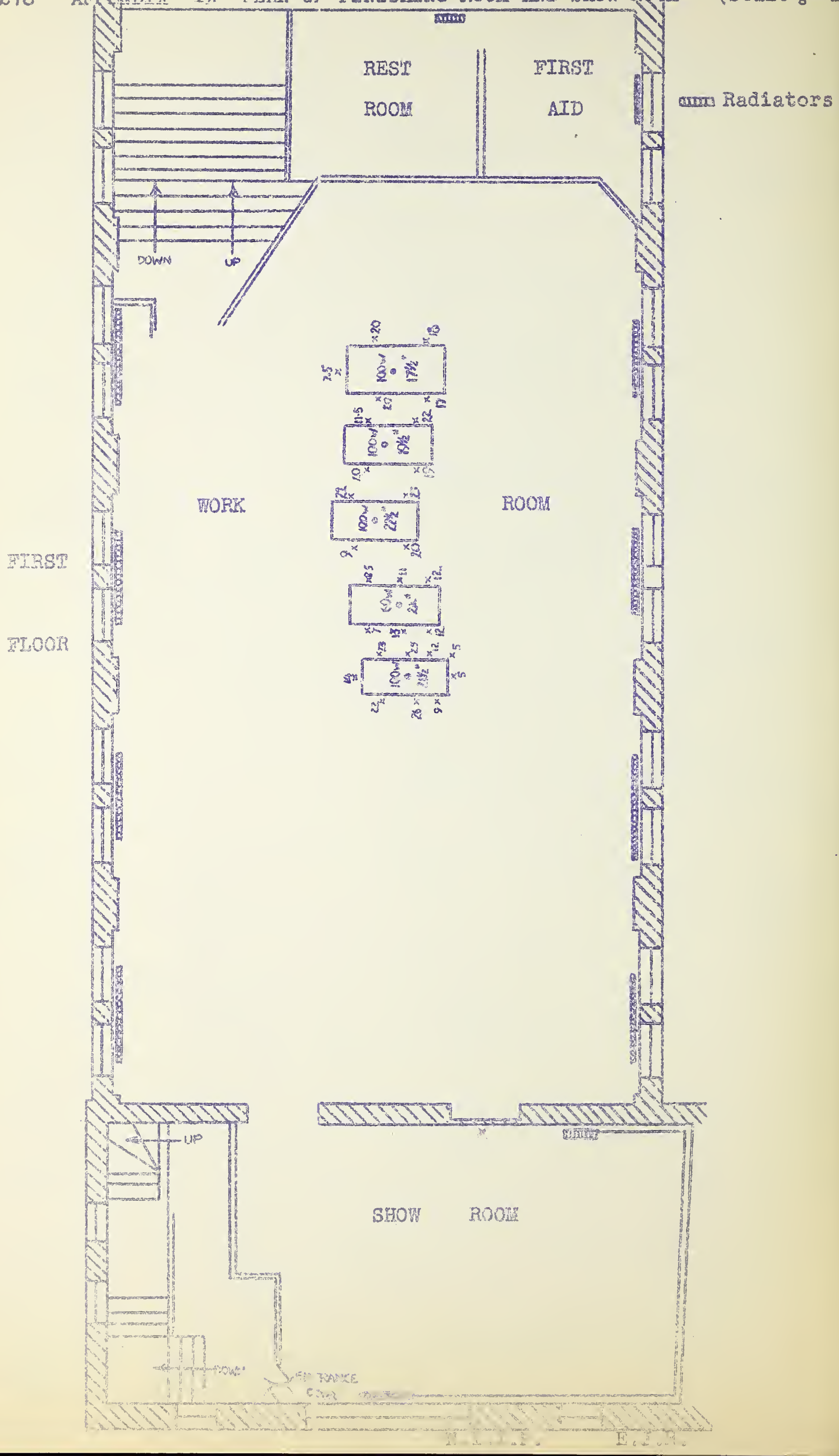
Gaiter sets	3. 4.
Pantos	1. 4.
Blazer	3. 1.
Ties	6d.

APPENDIX VIII.

PIECE RATES IN THE FINISHING DEPARTMENT.

V neck (stitched)	6d.
Plain V neck	4d.
Square neck	9d.
Jumper collars	6d.
Double collars	9d.
Rolled collar on dress, full length	1. 6d.
Armholes	4d.
Shoulders	2d.
Shoulders with steps	3d.
Darts	3d.
Small darts	2d.
Belts	1d.
Hip bands, single sewing	9d.
Hip bands, double sewing	1. 0d.
Skirt tops	6d.
Skirt tops with backing	9d.
Pleats	½d.
Dress mounting	1. 0d.
Double mounting	1. 6d.
Inset pockets	6d.
Patch pockets with strapping	5d.
Patch pockets without strapping	4d.
Buttonholes	1d.
Loops	½d.
Buttons	¼d.
Pipings, facings and panelling, per yd.	3d.
Binding, per yd.	6d.
Prick stitching Vest	1d.

R278 APPENDIX IX PLAN OF FINISHING ROOM AND SHOW ROOM (Scale ⅛"=1')



APPENDIX X.

STATEMENT OF ORDERS RECEIVED AND COMPLETED ON MACHINES.

	1 Machines.	2 Orders Received. lbs.	 ozs.	3 Orders Begun. lbs.	 ozs.	Orders Completed 4 By Demand. lbs.	 ozs.	 5 Actual. lbs	 ozs.	(in ½ days) Machines idle
Week ending 15/3/30 (44 hour week)	7 gauge	167	5½	167	5½	109	6	94	15	149
	8 "	18	12	18	12	45	1	32	7½	48
	10 "	267	12	267	12	194	13½	146	12½	0
		453	13½	453	13½	349	4½	274	3	
Week ending 22/3/30 (44 hour week)	7 "	103	12	103	12	142	12	123	15½	113
	8 "	45	8	45	8	41	6½	31	0½	54
	10 "	216	2	216	2	198	8½	152	13½	0
		365	6	365	6	382	11	307	13½	
Week ending 29/3/30 (50 hour week 10 gauge machine)	7 "	122	14	122	14	103	2	83	15	133
	8 "	28	4	28	4	47	8	34	8	47
	10 "	133	9	133	9	241	15½	187	3½	0
		284	11	284	11	392	9½	310	10½	
Week ending 5/4/30 (44 hour week)	7 "	88	8	88	8	129	10	108	12	122
	8 "	33	6	33	6	57	12	44	13	50
	10 "	323	10	209	9	177	3	141	7½	0
		445	8	331	7	364	9	295	0½	
	Totals.									
	7 gauge	482	7½	482	7½	484	14	416	9½	517
	8 "	125	14	125	14	191	11½	142	13	199
	10 "	941	1	827	0	812	8½	628	5	0
	Total	1549	6½	1435	5½	1480	2	1187	11½	

Number of Machines in Factory.

Jacquard Machines	3.
Purl Machine	1.
12 gauge Machines	2.
10 " "	18
8 " "	15.
7 " "	32.

APPENDIX XI.

TIME REQUIRED BY OPERATORS TO KNIT GARMENTS.

Name.	Model.	Time.
Cissie Cottrell	Cardigan (2133)	3 hours 20 minutes
Hilda Simmonds	2 Piece	4 " 40 "
	3 Piece (1498)	7 " 0 "
	3 Piece (1498)	7 " 10 "
	2 Piece	12 " 0 "
Violet Rebel	3 Piece	14 " 15 "
Irene Roberts	3 Piece	12 " 30 "
Sarah White	Loose knit cardigan with sleeves	2 " 30 "
Daisy Ayling	Cardigan	3 " 40 "
	Jumper & Skirt	6 " 5 "
	" " (766)	10 " 0 "
	3 piece (1498)	8 " 30 "
Lily Denham	Cardigan & Jumper	13 " 45 "
Rose Kiff	2 Piece (703)	6 " 10 "
	2 Piece (331)	7 " 30 "
Ivy Dunn	Jumper & Skirt	5 " 20 "
	Skirt (669)	2 " 25 "
	2 Piece	6 " 0 "
J. Smith	3 Piece (1498)	5 " 30 "
E. Bootman	2 Piece	8 " 50 "

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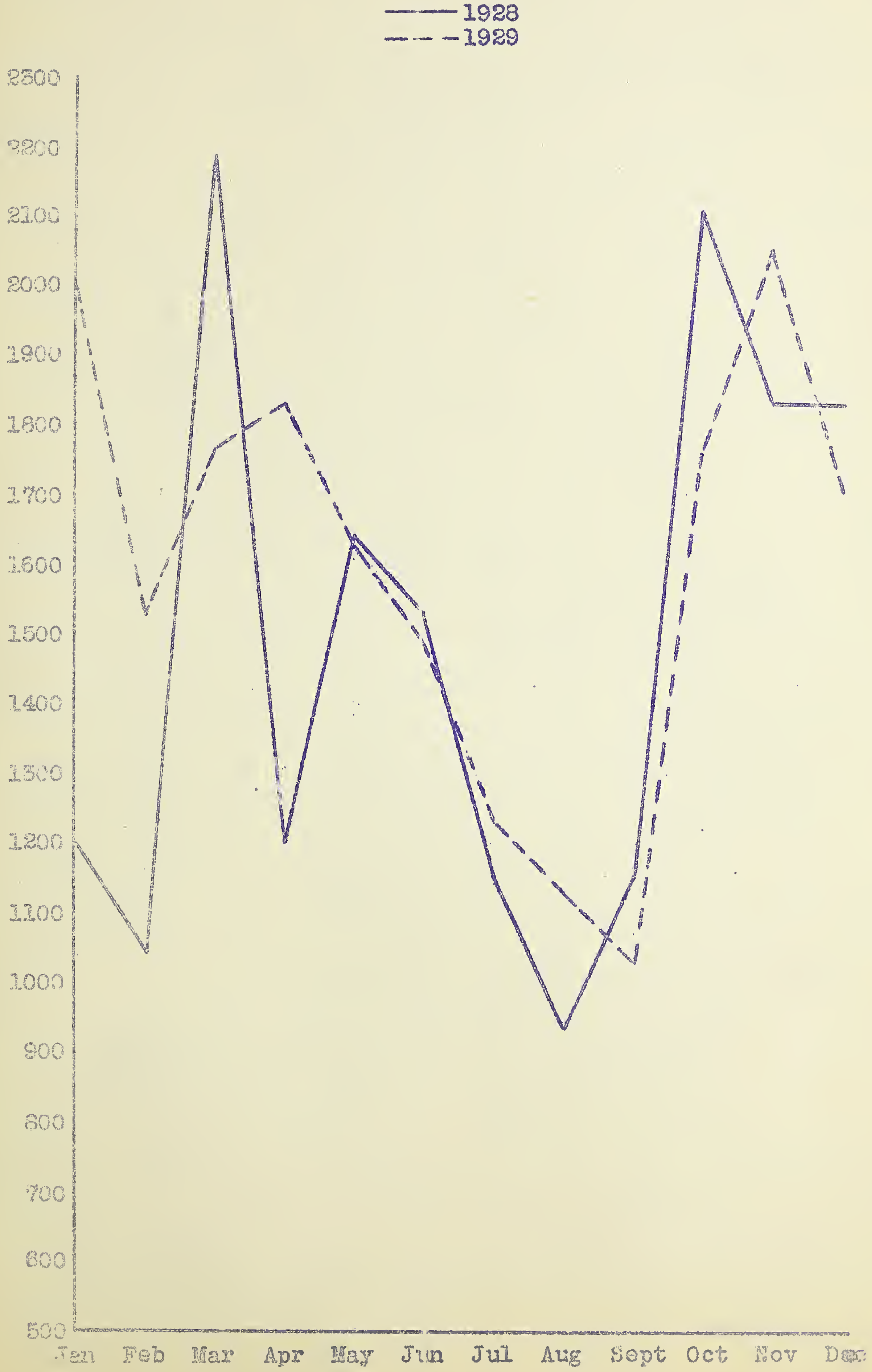
APPENDIX XII

SALES OF KNITTED WEAR



N.I.I.P. E.J.R.

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

REPORT

OF A SHORT STUDY OF THE WORKSHOPS OF THE ROYAL BIRMINGHAM INSTITUTE FOR THE BLIND

Period: 12 - 16 May, 1930.

Investigator: C.B.Fox.

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APPENDIX I. METHOD OF PAYMENT OF AUGMENTATION TO WORKERS' WAGES.

APPENDIX II. AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

I. INTRODUCTION.

A week's study was made of the various trades conducted at the workshops of the Royal Birmingham Institute for the Blind. The majority of the trades are conducted at the Harborne Workshops, while two are carried on at Carpenter Road, Edgbaston. In the latter place, the trainees receive full instructions in their specific trades.

Throughout this report the average wages[1] quoted have been taken over a period of a year ending on the 30th September, 1929. The hours of work per week vary between the men and the women, the former working 48 hours per week, and the latter 43½ hours per week. Owing to a slight depression in trade some of the men in the various departments were not fully employed.

A noticeable feature of these workshops is the method adopted of augmenting the worker's wages (see Appendix I). As the wages earned by a worker increase so his augmentation is diminished.

II. TRADES CONDUCTED AT HARBORNE.

The workshops at Harborne have been recently erected, and are composed of a number of single-floor buildings. As a block they add to the attraction of the locality.

All the walls of the buildings are completely white-washed inside, while overhead heating by pipes has been installed. This overhead system was adopted mainly on account of the deleterious effects the hot pipes would have on the raw materials (cane, willow, coir, etc.) if they were placed lower.

1. Basket Making.

The basket making department contains a maximum of twenty-two blind workers, of whom eight are partially sighted. During the period of this survey a number of workers were unemployed owing to a reduction in demand for baskets.

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[1] The average wage earned by a number of workers. Only full working weeks of each worker throughout the period under consideration have been taken.

All the workers are in a large room, one hundred feet by twenty-five feet. The 'pitch' permitted each worker is ample, its dimensions being eight feet by seven feet six inches. There are two rows of pitches along the length of the room, leaving a gangway ten feet wide in the centre. The planks on the pitches are thirty inches wide.

The foreman and assistant foreman of this department are also supervisors of the chair caning department. In addition, a finisher is employed, who also has other duties. These are the only sighted persons employed in the department.

The workers fetch their raw material from the storage room adjoining the workroom, soak it and convey it to the tank: they also cut their own stakes. They are paid on a piece rate determined by the British Amalgamated Union of Basket Makers. The average wage earned by twenty-two workers is 24s.6½d. per week per worker.

The fact that the blind worker fetches his material, soaks it in the tank, and particularly, cuts his own stakes, increases the total time taken to complete a basket, and it may prove an economic advantage to engage a boy for these duties. In some basket-making workshops employing blind labour the worker is not permitted to cut his own stakes, because of the enormous waste of time and material which thus results. If actual times were recorded of the period taken to cut the stakes, and if the actual waste occurring when the process is performed by blind workers was determined, the Management would be in a position to consider, on economic grounds, the employment of a boy. It is true that some time ago a worker was engaged to cut stakes, but, since his waste was even greater than that of a blind worker, apparently the wrong type of individual was engaged.

Special features of this department are the large amount of floor space given to each worker and the location of the tank in a room adjoining the workroom and under cover.

The pupils are trained at Carpenter Road, where the minimum period of training is five years.

2. Chair Caning Section.

Only four women are now employed in this section, which is in a room adjoining the Basket Making Department. Chairs are sent to this section for re-seating, etc., either by cane or by rush material.

Since the section is under the Foreman of the Basket Making Department and his Assistant, the office of the Foreman has been so placed that he has all the workers of both departments under observation.

Usually nine women are employed, but there is a general depression at the moment. The workers are paid on a piece rate determined by the Institution.

To cane a chair requiring 80 holes, 9d.

For any decrease on 80 holes, 1d.less for every 10 holes.

For any increase on 80 holes, 1d.more for every 4 holes.

An addition of 67½ per cent. is made for increased cost of living. The average wage earned by nine workers is 12s.3d. per week per worker.

The operators stand at their work, while the chair on which they are working stands on a table thirty inches high. We are of opinion that if the height of this table were reduced, workers could sit down and yet have sufficient physical control over their work to perform it satisfactorily. The resultant decrease in tendency to fatigue would have a beneficial effect on production.

If heavy chairs are repaired, we suggest that the chair be placed on a turn-table, so as to avoid the extra exertions of the worker in turning the chair round.

Training for this trade is conducted at Carpenter Road, where a period of two years is considered necessary.

3. Tennis Section.

Restringing of tennis rackets only is conducted in this section. The orders arrive so spasmodically that the worker who carries out the restringing is usually employed in the Brush Department. This section, however, is nominally under the charge of the Foreman of the Basket Making Department.

The worker (a man) is paid on a piece-rate, determined by the Institution, of 2d. for the first string and 1d. for each additional string on the same racket. In addition, he receives a bonus of 1d. for each racket partly restrung and 2d. for each racket completely restrung.

The man who restrings rackets was trained by a fully-sighted worker from the trade.

4. Brush Department.

This department is sub-divided into

i. drawn work,

ii. pan work.

i. Drawn Work. There are twenty-one women in this section, thirteen of whom are unable to see their materials. They work in two rooms with a woman charge-hand to supervise. She performs the work which any one of her blind workers is incapable of doing. In addition, she assists in finishing.

The work is of a 'close' character, where a little sight would appear to be of great assistance. There is no indication of this from Appendix II, which shows the wages earned by partially sighted workers and by totally blind workers in the same departments.

The workers are paid on a piece-rate determined by the Board of Trade. The average wage earned by twenty workers is 15s.6d. per week per worker.

The girls obtain a minimum training of three years at Carpenter Road.

ii. Pan Work. There are thirty-three workers in this department with an assistant foreman in charge. The foreman is in charge of the whole Brush Department. The main articles made are scavenger and rotary brushes.

Here - as distinct from most other workshops - the men sit at the pans, six in number, and not four as is customary. This reduces the floor area per worker considerably and therefore economises floor space.

The workers are paid on a piece-rate determined by the National Brushmakers Society. The average wage earned by thirty-five workers is 27s. 10½d. per week per worker.

The vapours from the room are extracted by overhead cowls.

A most noticeable feature in this department was the unsatisfactory methods adopted by some of the workers. Some of them performed many unnecessary movements which were so noticeable that it was easy to detect those workers who were in receipt of small wages. We understand that these workers arrived without any of these unnecessary movements, but that they have been acquired since arrival in the department. From this it would appear necessary to supervise such workers more closely. The assistant foreman, however, has quite sufficient to do in supplying material to the workers.

As a method of indicating which workers are responsible for poor work, identification marks - usually the initials of the worker - are placed on the backs of the brushes.

The workers are trained at Carpenter Road for a period of three years.

The backs of all brushes made in the Brush Department have the holes bored in them by four sighted workers, while all the brushes are finished and shaped by two partially sighted men. The two finishers are paid on the Board of Trade piece-rates: they earn the abnormally large wages of 83s. and 78s. per week.

5. Mat Department.

This department occupies two large rooms. One room is filled with looms, while the other contains the remaining looms of the department, the bobbin winding section, and the processes after the mats are woven on the looms.

The usual articles made here are mats for motor cars, ordinary foot-mats, coal bags, cylinder covers, etc.

i. The Bobbin Winding Section. Two girls are employed on bobbin winding. The coir yarn is received in skeins and is wound on bobbins by a hand machine, while some of the materials on bobbins are wound on to 'balls'.

ii. Weaving. The material on the 'balls' becomes the warp on the loom, while the material on the bobbins becomes the weft. The warp is made in the room which contains the larger number of looms. Pegs are placed in the wall, and each weaver runs up and down from one row of pegs to the other making the warp. We understand that a warping mill has not been introduced in this department owing to the lack of accommodation.

The material is then woven on to a loom. Definite measurements are given to each worker. Only men manipulate these looms. It is customary in most workshops employing blind labour to place the less intelligent blind on making mats. Since in actual practice great muscular energy is required in order to obtain a good wage in this trade, we consider that in selecting workers the primary criterion should be strong physique rather than low intelligence.

Training is conducted in the shop, but since the foreman is exceptionally busy, the training of late has not been of primary consideration.

iii. Finishing. When the material is taken off the looms the mats are taken to a partially sighted worker to be shaped. His wages average 55s. weekly, based on a piece-rate decided by the

Institution of 1d. per square foot.

The next processes are Binding, performed by two partially sighted girls, and then

(a) shearing and combing by machine, and

(b) trimming by hand shears.

Operation (a) is performed by a completely sighted assistant, while the foreman completes the mat at operation (b).

In all, there is a foreman and one assistant as sighted individuals in the department, as against a 'full-time' staff of sixty-four blind workers.

The average wage earned by the women in the Bobbin Winding Section is 20s.6d. per week per worker fixed by the Institution, on the following basis -

3s. per 1 cwt. of best yarn wound on to bobbins or balls,
2s.4d. " " " " common " " " " " " "

The weavers are paid on a piece-rate determined by the British Coir Mat and Matting Manufacturers Association. The average wage earned by twenty-two weavers is 26s.11½d. per week per worker.

The process of binding performed by two partially sighted girls is paid on a piece-rate. The mats are referred to by the length of their periphery: for example a mat 24 feet by 14 feet would be called a 76 feet mat (2 x 24 + 2 x 14 = 76).

The piece-rates paid are as follows -

Binding	76 ft.	86 ft.	96 ft.	106 ft.	116 ft.	126 ft.	136 ft.	146 ft.	156 f
Best & Double Quality.	3¾d.	2½d.	4¾d.	5¼d.	5¾d.	6¼d.	6¾d.	7¼d.	7 ¾d.
B & C Quality.	3d.	3¼d.	3½d.	4d.	4½..	4¾d.	5d.	5½d.	6d.

The layout of the finishing section is not as good as the Management would like it to be, since the material proceeds to the binding process and then returns along the same track to the last process. In routing this work the Management have been guided principally by the advisability of separating the women workers from the men. Greater efficiency has been obtained since this separation was effected.

The machine used for shearing and combing the mats causes a lot of dust and fluff to fly about in the department. We are of opinion that this has a deleterious effect on the efficiency of the workers in the room. If an extraction fan or vacuum container were placed over the machine, all the dust, etc. would be collected in the container, and this would permit of the room being kept in a clean and wholesome condition.

iv. Waste. Waste occurs in this department by the weavers occasionally preparing the mats longer than the requisite dimensions and by shaping mats to specific designs. This is necessary waste.

Figures are not recorded as to the quantity of waste due to either of the above causes. We are convinced that it is valuable to know the exact amount of waste that occurs.

All waste, however, is collected and 'teased' in a Devil Machine to prepare common brush mats. Every effort is made to utilise the waste formed in the department into some form of saleable product.

Steps should, however, be taken to reduce to a minimum the waste caused by preparing mats longer than the requisite dimensions. The loss by this method is a two-fold one. The superfluous material goes towards preparing common brush mats for which there is no regular demand, and the rate of production is diminished since the time spent on preparing superfluous material could be better utilised in complying with orders on demand.

6. Bedding Department.

This department is not yet completed. Two Singer sewing machines and a 'Teaser' have, however, been installed.

The sewing machines are operated separately by current from the main switch. The Teaser machine, made by Messrs.Walker & Smith, is operated by a motor. A partially blind man has already worked on this machine satisfactorily. The machine is well guarded to prevent accidents.

The department is under the foreman of the Mat Department.

7. Knitting Department.

This department occupies three rooms, the flat machines and the bobbin winding machine being in one room, while the round machines are in a room adjoining. The finishing room, however, is in another building about twenty-five yards away.

i. Room containing Flat Machines.

(a) Bobbin Winding Machine. A six-spindle bobbin winding machine is in use, but it is manipulated by hand by a partially sighted girl. This is a very laborious method and must be extremely tiresome to the worker. Besides, if threads break during the process of winding, the operator has either to stop the machine - thereby suspending the winding of all bobbins - or she must ask one of the other girls in the department to turn the handle, while she attends to the spindle concerned. Neither method is satisfactory. A high output is not required from this machine, which has to supply only the four flat machines with material. This, perhaps, is partly responsible for the method of winding, which is also due, in part, to the policy of finding employment for all the girls. The winder should be capable of supplying wool to all the flat machines.

(b) Flat Machines. There are in all ten flat machines, of which

3 are 12 gauge
1 is 10 "
4 are 7 "
1 is 7 (Schaffhouse) Jacquard.
1 is 9 " "

The last two machines and one of the plain seven gauge machines were not working at the period of this investigation.

There was one sighted assistant who performed the duties of 'picker-in'.

The workers are paid on a piece-rate determined by the Institution. The average wage earned by eight workers is 19s.1d. per week per worker.

A new system of general lighting was installed in March of this year. There is, however, need for good local lighting in order to assist the picker-in in her duties. We recommend the use of a movable local unit during the winter months. The flex should be long enough for the light to be taken to any of the machines in the room. The same unit could, if required, be used in the room containing the round machines.

ii. Round Machines. There are twelve round machines in this department, but only five were in operation. A sighted assistant is in charge of this section.

The workers wind their own material. The average wage earned by ten girls is 14s. per week per worker.

If the output on the bobbin winder could be increased in order to wind material for the round machines, the wages of these workers would be considerably increased.

iii. Finishing Section. Garments are cut and shaped in the Knitting Department, so that a certain amount of waste in cutting to specific shapes is necessary. A noticeable feature, however, is the great care taken to prevent unnecessary waste due to preparing the garments longer than the requisite measurements. All the girls in this section are completely sighted.

An examination of the cupboard which contains three cones of the same type of wool revealed that occasionally two cones of the same wool were placed on one shelf, while the third was on another shelf. These cones of the same material were frequently separated from one another, although they are always used together. There are, in all, four shelves in the cupboard - the distance between each shelf being approximately ten inches. We recommend that these four shelves be replaced by three, twelve inches apart. The cones containing the same type of material should be made to stand on one another in cone fashion, so that the amount of space taken up is considerably smaller than that taken up by the present method of storage. The time required to extract the three cones from the cupboard will also be considerably reduced. When they stand on each other the height will be approximately eleven inches.

III. TRADES CONDUCTED AT CARPENTER ROAD, EDGBASTON.

1. Boot Department.

There are six workers (men) in this department, and they all possess a little sight. There is insufficient work to employ them all continuously, but despite this fact, the average wage earned is 26s. per week per worker, paid at a piece-rate determined by the Board of Trade.

Boots and shoes are both made and repaired. In the majority of cases orders are received from individual customers.

There is a sighted foreman, who feeds the workers at the bench. If time permits, he also cuts the leather to the shapes required. When, however, the workers cut their own material - in order to save waiting time - a greater proportion of waste results. The amount of waste caused in shaping the leather, etc. is considered to be approximately sixteen per cent.

In making boots and shoes, the complete tops or 'uppers' are purchased.

Each worker performs the entire work necessary on the pair of boots or shoes manufactured.

Training for this work is conducted at Carpenter Road, where a period of three years per worker is the average required.

2. Piano Tuning Department.

There are five piano tuners in this department, four of whom are totally blind. The tuners are sent out to attend to the pianos at the various local houses, etc., though, for purposes of complete renovation, the pianos are brought into the department.

There is a foreman, with an assistant, the latter being partially blind.

The average wage earned by the tuners is 31s. per week per worker at a piece-rate of 2s.9d. per piano. The workshop, however, levies the following fees for tuning.

	Pianos	
	Upright	Grand
One tuning	5s.	7s. 6d.
Two tunings per year	9s. 6d.	14s. 6d.
Three tunings per year	14s.	21s.
Four tunings per year	18s.	27s.

The training school is in the room adjoining the workshop. All pupils are first given a trial for three months. After the trial a period of three to four years is considered necessary for the training.

IV. CONCLUSION AND ACKNOWLEDGEMENTS.

Throughout the factory a spirit of friendliness exists between supervisors and workers. The Management are ever considering new methods of assisting the workers in their duties, while all the staff and workers place implicit trust in their manager, Mr.Starling. The feeling he has brought with him of complete co-operation with the blind has permeated throughout his entire staff. A spacious, well-equipped canteen has recently been erected, and this supplies the workers with meals at an extremely low price. The workers have greatly appreciated this addition to the workshops.

We wish to express our appreciation of the assistance given to our investigator by the entire staff of the Institution, and especially thank Mr.S.W .Starling, the General Manager, and his assistant at the workshops, Mr.Boulton.

5th June, 1930.

(Signed) C.S.Myers.
Director.

APPENDIX I.

METHOD OF PAYMENT OF AUGMENTATION TO WORKERS' WAGES.

Men

Earnings of		10s.	per week,	augmentation 22s.6d. weekly.
"	from 10s.	to 20s.	" "	this augmentation is reduced by 1d. for every 1s. earned above 10s.
"	from 20s.1d.	" 30s.	" "	augmentation reduced by 2d. for every 1s. over 20s.earned.
"	from 30s.1d.	" 40s.	" "	augmentation reduced by 3d. for every 1s. over 30s. earned.
"	from 40s.1d.	" 50s.	" "	augmentation reduced by 4d. for every 1s. over 40s. earned.
"	from 50s.1d.	" 60s.	" "	augmentation reduced by 6d. for every 1s. over 50 earned.

Minimum Augmentation 9s.2d. per week.

Allowances to Married Men.	2s.	per week.
First child	1s.6d.	" "
Subsequent children	1s.	per child per week.

Women.

Earnings of 10s. per week, augmentation 20s. weekly.

Decrease augmentation by 3d. for every 1s. earned above 10s. per week.

APPENDIX II

AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES

Departments	Average wages earned per week per worker by -			
	Partially Blind.		Totally Blind.	
Basket.	23s.11d.	(7)	24s.10d.	(15)
Chair Caning.	12s.6d.	(3)	12s.1d.	(6)
Tennis.	-		-	
Brush. Drawn Work.	13s.9d.	(9)	16s.11d.	(11)
Pan Work.	28s.7d.	(19)	26s.9d.	(16)
Mat (weaving).	29s.	(5)	26s.5d.	(17)
Knitting (Flat Machine).	19s.8d.	(5)	18s.	(3)
(Round Machine).	15s.9d.	(4)	12s.10d.	(6)
Boot.	26.	(5)	-	
Piano Tuning.	-		31s.	(4)

The numbers in brackets are the number of workers from whose wages the average wage is calculated.

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

REPORT OF A SHORT STUDY
OF THE
LIVERPOOL WORKSHOPS FOR THE BLIND,
CORNWALLIS STREET,
LIVERPOOL.

Investigator: C. B. Fox.
Period: 2nd - 6th June, 1930. (inclusive)

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V. CONCLUSION. (p.10.)

I. INTRODUCTION.

The Liverpool Workshops for the Blind at Cornwallis Street form two large buildings on either side of the street and facing each other. The building containing the present offices etc., was first acquired and, for the purposes of differentiation, will be referred to as the "Old Building", the other being designated the "New Building". The trades conducted at these workshops are the usual ones undertaken by most of the workshops employing blind labour in this country viz: the preparation of baskets, mats and brushes. In addition, there are two small departments - Chair Caning and Bedding. In contrast, however, to most other workshops employing blind labour, the management do not attempt to create a retail trade. Every effort is made to secure wholesale orders. It is due partly to this, and partly to the intimate knowledge the Manager possesses of the trades conducted here, and to his extremely close contact with his staff, that the workshops obtain a great measure of success. A nett profit was made last year.

Every effort is made to place workers on a piece-rate. The average wages[*] earned in each department are shown in Appendix I.

There is a 'flat' method of paying augmentation to all workers except those in the Basket and Mat Departments. In the Basket Department 16/6 is paid weekly to workers on square intricate work, while 10/- is paid weekly to those on rough work e.g. ballast hampers. In the Mat Department, however, workers are paid 16/6 plus half their earnings, provided that the total augmentation figure never exceeds 28/- weekly.

The hours of work are 45 per week for men and 43 for women. The women are permitted a rest pause of 15 minutes both in the morning and in the afternoon sessions. A rest pause is taken by the men, but it has not received official sanction. We are of opinion that it would be advantageous to the management to recognise this pause officially and to allot a definite period for it.

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[*] Only wages earned by workers for full working weeks have been taken into consideration.

All the walls of the rooms are painted white, and the ceilings also in some departments.

II. TRADES CONDUCTED IN THE OLD BUILDING.

1. Brush Department.

In this department, both Drawn and Pan work are performed; and in contrast to many other factories employing blind labour, men are also employed in the preparation of wire-drawn brushes.

The holes for the backs of brushes for both Drawn and Pan work are bored by three single-spindle and one six-spindle machines. Two of the workers employed on these machines are partially blind. Those who are continuously employed on this work are paid on a piece-rate fixed by the Board of Trade. The work is performed in a small room on the first floor, and the "stocks" are then taken up to the various departments for Drawn and Pan work.

(1) Drawn Work. Drawn work is performed by both men and women.

The men, six in number, work in a room on the second floor. None of them is able to see his material. All the men sit at their work with their faces to the window. They are supplied with raw material etc. by a partially sighted man, who acts as a "general-factotum" for the whole of the Brush Department. These six workers are paid on a piece-rate fixed by the Board of Trade.

In the same room, four sighted men are employed on time rates, making paint-brushes, white-wash brushes etc. Two of them also make brushes on pan-work. (There are two tables for pan-work in this room; one is used by these sighted workers, while the other is for three workers from the pan-room.)

The room in which the women are employed is on the first floor. There are sixteen girls employed, of whom only seven are able to see their material. The girls make the smaller brushes viz: for shoes, buttons, clothing, scrubbing etc.

The women sit in three rows facing the window; the totally blind are not separated from the partially sighted. Since decidedly more daylight is received on the first than on the third row, it would be interesting to move a partially sighted girl from the back row to the front and to note the effects, if any, on her output or on the quality of her work.

The workers are paid on a piece-rate determined by the Board of Trade.

In charge of this sub-department there is a partially sighted worker, who trims the brushes before passing them on for the process of Finishing.

The training of women in this trade is conducted at the School for the Blind in Hardman Street, Liverpool - an entirely separate institution. A period of 5 years is considered necessary, but this is not always adhered to, particularly if the trainee is an apt pupil and progresses rapidly.

The men, however, receive their training in the workshop.

(ii) Pan Work. Men are employed in this department, which is sub-divided into:-

(a) Hair Pan Work, and
(b) Scavenger Pan Work.

The method of preparing the brushes is the same for both types of work. The raw material is selected by the worker, dipped into the pan containing the pitch, and after one end has been tied, and dipped once again into the pitch, it is placed in one of the holes in the "stocks".

The initials of the workers are placed on the backs of each brush, so as to determine responsibility for faulty work.

There are two sighted assistants for this department, which is on the ground floor. One of these feeds the workers on scavenger pan work, bores all the holes for those brushes for which patterns are not available, and attends to the trimming of these brushes. The other assistant performs the same duties for hair-pan work, but in addition, acts as an instructor for the training of all new workers for either type of work. Although the duties of the two sighted assistants are thus differentiated by the management, the workers on one type of work are not separated from those on the other type. The same pan and pitch are used for working both kinds of brush.

In the room for drawn work for men already referred to, two tables for pan work are installed. One table is used by two sighted men to make paint brushes, etc., while two partially sighted workers are employed on the other table on hair-pan work.

All the workers are paid on a piece-rate determined by the Board of Trade.

In both rooms where pan work is conducted, overhead cowls are utilised for extracting the pitch vapours; but as has been mentioned in previous reports, this has not been found to be a satisfactory method. The cowls in this department, however, are placed at a greater distance from the pans than in most other factories practising this trade. The distance, in these workshops, is approximately two feet six inches. We understand that the reason for this is to prevent a recurrence of the fire which occurred when the cowls were considerably lower.

Square tables are provided to accommodate four workers each, but at the time of our visit, some of the tables did not have their full complement of workers.

The period of training required for this work is considered to be five years. Since, however, the training is conducted by a man in the department who has other duties to perform, it cannot be given the attention which is desirable.

In work of this character, there is ample scope for investigation of the methods and layout adopted, and for time and movement study. Rough "timings", for example, were taken of different workers (tying knots to hold the bass or hair together before placing them in the stock). These showed that while one worker required 43.3 seconds to tie 10 knots, another worker at the same table required 100 seconds. We are of opinion that there is a fruitful field here for investigation, and, though it would be difficult to break the bad habits already formed by workers, the results obtained from such an investigation would be of considerable value in training new workers at the schools.

The whole of the finishing of this department is performed by three workers. Two of them are partially sighted, while the third is fully sighted, and is employed for intricate work. The finishing is performed in the same room where the stocks are bored.

2. Bedding Department.

The work in this department is split up into three processes The first process, and, in most instances, the third, are conducted in one room on the first floor, while the remaining work is conducted in the new building.

Mattresses, covers, pillow-cases etc. are made by the women on Singer Sewing Machines and are sent over to the second floor of the new building to be filled with hair, wool, etc. by men. The pillows etc. are then returned to be sewn by the girls, while one girl is sent over to the new building to sew up the mattresses.

Chair caning section. Chair caning is also carried on here, in a room adjoining the bedding department. Some of the girls work at both trades, and so are interchangeable.

The two sections are quite small, and are under the care of a sighted worker.

There are six sewing machines which are electrically driven from the one shaft.

The whole department is a small one, and is not directly comparable with any of the other trades conducted by the blind at Liverpool.

III. TRADES CONDUCTED IN THE NEW BUILDING.

1. Bedding Department.

Mattresses etc. are filled by hand by men on the second floor of this building. Only five workers are employed.

On the roof, a sighted man works the Teazer Machine.

All the workers in this department are paid a day wage. The department, in fact, is considered a "back number" for the present. It would be advantageous to the management if the whole Bedding Department could be placed on one floor in the same building.

2. Basket Department.

This department is on the first floor, and consists of a very large room. There are thirty-six men here, of whom thirty are totally blind. Square hampers are the chief product, but fenders of cane are also made and supplied to the shipping industry. These fenders are a great deal lighter than those made by the blind in the usual Mat Departments, and consequently, there is now a demand for them.

The workers are all paid on a piece-rate fixed by the Board of Trade.

Since the room is extremely wide, four rows of pitches have been made. There are the usual two rows alongside the walls, down the length of the room, taking full advantage of the daylight. At the end of either row, there is a space of approximately two feet six inches which permits of access to any pitch in the row, and a further row of pitches on either side has been made. There still remains a central gangway twelve feet wide, and this is utilised for piling up finished baskets ready for inspection and completion by the supervisors.

The pitches of the workers were originally set out to be nine feet six inches square, which provides ample room. As some men, however, are always employed on small work, smaller pitches have been allotted to them, the accommodation being apportioned according to the needs of the workers.

A noticeable feature of the position of the workers in the two centre rows was that they had their backs to the workers in the rows behind them, and thus also to the nearest source of daylight.

There are four tanks just outside this room for soaking the raw materials etc. These tanks, however, are in the open, and fully exposed to the weather. No tank is allotted for brown willow work, since very little of this type of work is performed here.

The workers prepare and complete each basket, though the work of finishing is done by the foreman and his two sighted assistants. The workers cut their own stakes here.

Training is conducted at Hardman Street, where a period of four years at least is allotted.

Chair Caning Section. A few men are employed on chair caning and repairs. They work under the guidance and instruction of a fully sighted worker, who also assists in the actual work.

This section is under the management of the Basket Department, where there is a Foreman, and two assistants.

3. Mat Department.

There are fifty-six looms in the department. Of these, forty looms - for coarse work - are in one room, while the remaining sixteen are in another room and are used only for fine texture work.

The usual type of articles are made here, e.g. mats and fenders. In addition, a large market has been found for "matting". This matting is purchased by the workshop in long strips, cut up into definite lengths and bordered. The bordering is performed by the aid of a Singer Machine which is electrically driven. A partially sighted man works this machine. It is of interest to state that he has been taught to sew fairly long pieces at a stretch. This bordering is performed in a room in the basement, where all the mats etc. are inspected before final despatch.

The department possesses a Warping Mill which is manipulated by a partially sighted man, who has other duties to perform. The mill is in a room in the basement.

Yarn is purchased in hanks, placed on "runners" and then made into balls by each weaver. This yarn makes the weft of the mat.

The room containing the looms for fine weaving is on the ground floor, while the room containing the remaining looms is on the floor above. The process of weaving is identically the same as in other mat factories employing blind labour.

There is a totally blind man in charge of the room where fine work is performed. In addition, he prepares the wool for the wool-bordered mats.

The mats are then trimmed on a Trimming Machine, which is fed by a partially sighted worker .

Kneeling mats and Sinnet mats are also made in this Department.

Sinnet Mats are made by hand; they are woven round "pins" which are fixed on the tables. All the workers are in the same room, which is in the basement. Each worker completes his own mat and borders it by adding a "plait" round the edge. Plaits are made on four Plait Machines which are manipulated by two partially sighted workers - one worker attending to two machines.

Kneeling Mats are made on the looms for coarse work, and after trimming, are sent down to the finishing room for bordering.

There are eight workers for finishing the mats. All workers including finishers are paid on piece-rates. Should mats arrive in the finishing section longer than the required dimensions, the finishers have to cut them to the specified lengths. This increases the time spent by a finisher on a mat and consequently reduces his wages.

There are in all three sighted workers to attend to the supervision of the whole department. Of these one is the

Foreman, another the Assistant Foreman, while the third is a general assistant. All work is collected, inspected and recorded by the above supervisors.

Training for this trade is conducted at Hardman Street, where a period of five years is usually allotted.

IV. CANTEEN.

There is a canteen in each building. The men attend the canteen in the new building, while the women attend at the old building. The management supply a one-course luncheon of meat and two vegetables, with bread and tea at 1d.per head. The Canteen is consequently fully patronised.

It may be feasible to place both canteens in one building, and the whole of the Bedding Department in the other. This would tend to reduce the cost of maintenance for each department.

V.CONCLUSION.

It was noticeable that the heads of each department appeared to know their particular trades singularly well. They were not merely acquainted with the methods conducted at these workshops, but also with those throughout the trade. The markets for purchasing raw material etc. were also known to them. In many instances raw material is not bought locally; some is purchased from London, and some from Hull.

In conclusion, we wish to express our appreciation of the assistance given by the entire staff of the workshops, and especially by Mr. J. Dunning, the General Manager.

(Signed) W.R.O'N.Manning.
For Director.

26th June, 1930.

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APPENDIX I.

WAGES PAID FOR THE QUARTER ENDING 31st DECEMBER,1929.

Department.	No. of Workers.	Average amount paid per week.	
		As wages.	As augmentation
Brush (includes both pan and drawn work.)	33	28/6	16/6
Brush (women)	12	16/9	16/6
Bedding (women) and chair caning.	9	13/6	16/6
Bedding (men)	5	30/-	16/6
Baskets (include chair caning)	27	32/-	15/-
Mat	44	22/4	25/6

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

Report of ~~Investigation~~ VISIT

~~AT~~

to the

Workshops of the Institution for the Blind.

LEICESTER.

Period : 29th July to 9th August, 1930.

Investigator : C. B. Fox.

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II. TRADES CONDUCTED IN THE WORKSHOPS. (pp.3-12)

1. Basket Department. (pp.3,4)
2. Mat Department. (pp.5,6)
3. Brush Department. (pp.6-8)
   i. Drawn work
   ii. Pan work.
4. Weaving Department. (pp.8-10)
5. Knitting Department. (pp.10,11)
6. Chair Caning Department. (p.11)
7. Basketry Department.(pp.11,12)

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APPENDIX I. Average Wages Earned by Workers in the Various Trades.

APPENDIX II. Piece Rates for Ordinary Chair Caning.

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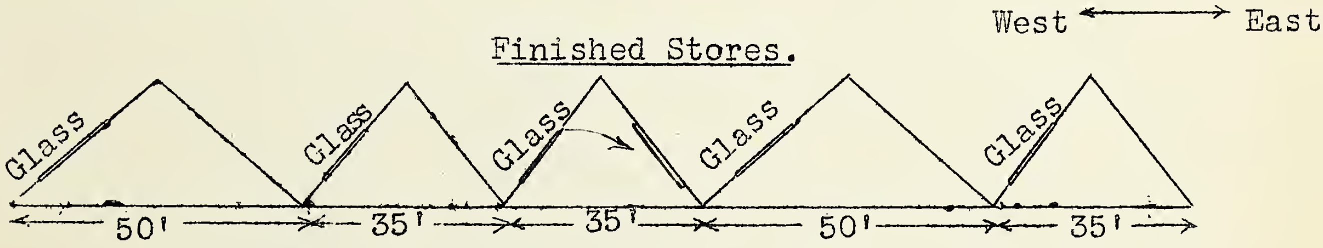
I. INTRODUCTION.

The workshops building of the Institution for the Blind at Leicester was erected about seven years ago. It was specifically designed to suit the accommodation required for the various trades conducted by the blind. There is only one floor. Particular attention has been given to permit extensions or reductions to the space allotted to departments with the least possible cost in structural alterations. The departments and passages have been marked out by partitions approximately eight feet high.

The building has only two walls inside. These walls are in the centre: between them are stored all the finished articles. The roof is of the 'sawtooth' pattern, with five 'teeth', the stores being within the middle one. The span of the'teeth' vary, as will be seen from the following rough diagram of the roof.



The building runs from East to West. Glass has been placed on each slope of the roof over the Finished Stores, but it has been placed on only the west side of the remaining 'teeth'. On a hot summer afternoon, workers are apt to feel the heat transmitted through the glass, and this ultimately affects their output. There are no openings to permit any air to come into the building from the roof. The glass in the roof gives full advantage of daylight. We would, however, suggest that measures could be introduced to improve the ventilation conditions. Greater comfort would be obtained for the workers, and the resultant effect would

Patrons:
HIS MAJESTY THE KING
HER MAJESTY THE QUEEN

Chairman:
[illegible] FT TOWSE.
[illegible] DWYER,
[illegible] I.E., K.C.S.I.

Telephone:
MUSEUM 9701

NATIONAL INSTITUTE FOR THE BLIND

(REGISTERED UNDER THE BLIND PERSONS ACT, 1920)

Hon. Treasurers:
G. F. MOWATT, J.P.,
A. J. W. KITCHIN, C.I.E.
Secretary-General:
W. McG. EAGAR.

Telegrams:
"AVEUGLES, WESDO, LONDON"

224-6-8 GREAT PORTLAND STREET, LONDON, W.1

E. Whitfield, Esq., Ph.D.,

27th October, 1930.

Dear Sir,

A meeting of the Placement Sub-Committee will be held in the Council Room of the Institute, 224-6-8, Great Portland Street, London W. 1, on Tuesday, 4th November, 1930, at 2.30 p.m., and it is hoped that you will be able to attend.

Yours faithfully,

W. McG. Eagar

Secretary-General.

AGENDA.

1. Appointment of Chairman.
2. Appointment of Vice-Chairman.
3. To consider contract renewal with N.I.I.P. for one year from 1st November, 1930.
4. To consider information obtained from questionnaire on ratio of blind to sighted workers in blind workshops.
5. To consider further Bulletin No: 1 on Placement Work.
6. To consider publications of Bulletins on:-

    (a) Higher Education.
    (b) Trades in workshops for the blind.

7. Placement Officer's report on:-

    (a) Shorthand-typing.
    (b) Placements effected.

8. Concession Stands.
9. Brick and Tile making.
10. Tennis racket frame "Bending".
11. To consider N.I.I.P. reports on:-

    (a) Liverpool Workshop for the Blind.
    (b) Leicester Workshops for the Blind. (attached)
    (c) Nottingham Workshop for the Blind. "
    (d) Henshaw's Workshops. "

12. Placement Work; consideration by the Union of Associations.
13. To consider need for research in the Education of the Blind.
14. Other business, if any.

be an increase in output. A fuller study of the problem is required before detailed recommendations can be made. Some of the departmental doors are at present kept open to improve the ventilation, but this creates considerable draughts.

Where possible, workers are paid on piece-rates. Appendix I shows the average weekly wages earned in each trade. The figures have been taken to cover a period of four weeks ending on the 25th July 1930, and only full working weeks have been taken into consideration. It is worth noting that the workers in the mat department have been paid by a piece-rate system only since early November 1929. Previously, they were paid on a time-wage, though their work was evaluated on the present piece-rate method of payment. The average wages earned by the workers in this department before and after the introduction of the piece-rate system of payment are given in the following table.

	Before. (Four weeks ending 2nd August, 1929)		After. (Four weeks ending 25th July, 1930.)	
	Partially Blind.	Totally Blind.	Partially Blind.	Totally Blind.
Weavers, Mat Looms	9/6 (1)	12/6 (2)	26/3 (1)	26/8 (3)
Weavers, Coal Bag Looms	8/6 (2)	7/- (1)	16/2 (2)	13/6 (1)
Finishers, Binding and Squaring.	8/10(4)	7/7 (2)	19/4½(4)	16/- (1)

These averages are based on four full consecutive weeks. The numbers in brackets are the number of workers from whose wages the average wage is calculated.

The increase in wage earning capacity may not be due entirely to the introduction of the piece-rate system of payment. There are other factors which enter into this problem, such as the growth of acquired skill, and improved methods of working. The management are of opinion that the financial incentive has been mainly responsible for the increased wages earned.

The men work 45¼ hours per week, and the women work 42¼ hours per week. Both men and women have a ten minute break in each of the morning and afternoon sessions.

The method of paying augmentation to workers is as follows. Workers who earn up to 12/- per week are paid 22/-. The augmentation is then decreased by 3d. for every shilling earned above 12/- per week. In addition, 3/6 per week is paid for every child under the working age of fourteen years.

A notable feature in the workshops is that the men are permitted to smoke while at work.

A point of singular interest is that this is the only Blind Institution in the Country which does not make any claim for gratuities nor receive any financial benefits from the local authorities.

II. TRADES CONDUCTED IN THE WORKSHOPS.

1. Basket Department.

The shops in which the journeymen prepare baskets occupy the floor space covered by the extreme west 'tooth' of the roof and are fifty feet wide. Since this space is too broad for only two rows of basketmakers, a partition has split the room into two, so that it may accommodate four rows, with two aisles, each about four feet wide. The pitch apportioned each basketmaker, nine feet by nine feet, seems more than adequate for his requirements. The pitches for both journeymen and pupils are marked out by partitions eight inches high. This prevents one worker from trespassing on the floor space allotted to his neighbour. There is accommodation for sixteen journeymen. The pupils are in a room by themselves. The type of work performed here is general square work, round work, and the making of fancy baskets and chairs.

A sighted Foreman is in charge of the department, while his assistant, a completely sighted man, is responsible for the training of the pupils. In addition to his duties of booking up etc., the Foreman, with the assistance of a partially sighted worker, inspects and finishes the work performed by the journeymen. The Assistant Foreman also assists whenever necessary.

All material is sorted and brought to the workers, though the wetting of incomplete baskets and the second dipping of the material is performed by the workers themselves. They cut their own stakes, though the sticks are given them already cut and prepared.

All workers are paid on a piece-rate determined by the British Amalgamated Union of Basket Makers.

There are four tanks for the use of the journeymen and pupils, though one of these is used for brown willow. All four tanks are under cover, but two are accessible only from outside the building. A notable feature is the method of economising the water supplied by the Corporation. A large tank is placed above these four tanks, and this is filled by rain water. When any of the tanks for soaking the materials require a fresh supply of water the water is drawn from the large tank above. This reduces the demand for water from the Corporation, though the water received in these tanks is not always fresh.

There are twelve pupils in this trade, and these work in a room by themselves. The training occupies a period of four years.

2. Mat Department.

Here the usual articles produced are the ordinary mats, kneeling and sinnet mats, and coal bags.

The raw material is first wound into balls by hand. The men who wind these balls are paid on a time wage. The time required to wind one hank of coir was 9 minutes 35 seconds: another timing was taken on a different individual and was found to be 6 minutes 25 seconds. There exist, therefore, marked individual differences. This is due partly to the lack of financial incentives in the operation (since it is paid on a time-wage), and partly to the laborious and yet monotonous nature of the task, which has to be performed by hand throughout the day. With the addition of a one horse-power motor and a small mechanical device, the balls can be wound at a far greater rate, with a consequent reduced cost.

The warp is made from these balls but there is no Warping Mill. Instead, pegs are placed in the wall, and a man walks up and down from one row of pegs to the other making the warp. Only single thread is used. A warp of forty-five yards length was prepared in this manner in two and a half hours.

The material is then taken off these pegs and wrapped round a drum, and from this it is transferred to the beam belonging to the loom. This 'beaming' from the drum is also performed by hand. The time required to beam forty-five yards of material from the drum was six and three quarter minutes, six men being employed in the process. If the beam were revolved by a small motor, the total time of 'beaming' direct from the warping mill would be considerably reduced. In actual practice, sixty-five yards of coir have been beamed from a mill in four and a quarter minutes, only three men being employed.

The beam containing the material is then placed on a loom.

There are eight looms in all in this department. The weavers are paid on a piece-rate fixed by the British Coir Mat and Matting Association. These weavers were paid on a time-wage until a year ago.

After the mats have been made on the looms, they are squared and bound by two partially sighted workers who are paid a piece-rate.

The mats are then sheared and trimmed by the Foreman on a machine in a separate room. All the dust etc. formed during the process of trimming is removed through ducts by an extraction fan. We understand that the dust and coir is removed very effectively. (The machine was not in operation during the period of the visit.)

Kneeling and sinnet mats are made here, though the plaits are purchased ready-made.

Coal bags are woven on the looms and finished by hand. Although a trap to hold the bags firmly was placed alongside the table in order to permit the worker to use both hands for finishing, this trap was not in use. Great advantage is taken of this device in some of the other institutions.

The pupils work in the same room as the journeymen, and receive their instruction from the Foreman - the only sighted person in the department. The minimum period of training for this trade is four years.

3. Brush Department.

Both drawn and pan work is performed here, and, as is customary in Blind Institutions, these are performed in different rooms.

i. Drawn work. There are three totally blind men and one totally blind woman working at this trade. To separate the woman from the men, the management have placed her in the same room as the journeywomen in the Chair Caning Department. All four workers have the holes in their stocks bored for them by a sighted worker, who 'finishes' the brushes. All workers in this department, including the sighted man, are paid on piece-rates fixed by the Brush and Broom Trade Board. The usual type of articles for drawn work is manufactured here.

ii. Pan Work. There are three pans in this room, in which three journeymen, five pupils and one sighted worker are employed. The sighted worker bores the holes in the stocks and trims all the brushes prepared by the blind workers. He also works at a pan. The journeymen are not separated from the pupils.

The workers sit at tables fifty-two inches square. The pan, as usual, is circular, and having a diameter of 12½ inches. It is divided into four quadrants, the divisions being placed immediately in front of each worker to permit him to wipe the brush on the dividing metal. The flame is obtained from a bunsen burner, circular in shape, which is placed about two and a half inches below the pan. The bunsen ring has twenty-five jets which lie in a horizontal line. The flame consequently first appears horizontal, and then gradually has effect on the pan immediately above it. By this method, we are of opinion that full use is not made of the heat available, and undue proportion being lost by radiation and conduction.

There is a small 'tablet' placed on the left of each worker, on which is placed the hair, bristles or bass. But the quantity required for immediate use by the worker is placed on a 'saddle' built on the tablet, so that the worker can pick up his raw materials easily. There is another 'saddle' placed on the table immediately in front of him so that one end of the brush may lie in it, facilitating easy handling.

'Whitening' is used in this work.

One of the special features of this department is that the totally blind workers are permitted to prepare only bass brooms.

We understand this is one of the easiest types of brushes to manufacture.

The vapours are very satisfactorily extracted by overhead pipes twelve inches in diameter, while the entrances to these pipes are twenty-four inches in diameter. The diameter of the extraction fan is approximately eighteen inches. This is the first successful overhead method of extraction that we have observed.

Large individual differences between workers are again revealed. Of the three totally blind journeymen in the department, the highest wage earned is 38/- per week, while the lowest is 15/4. This evidence, with that obtained from other institutions, tends to indicate that greater attention might be paid to the method adopted for the training of the pupils.

The pupils undergo a course of training of an average of four years for both drawn and pan work.

The Foreman of the department has to perform the duties of hair dressing and buying in addition to the usual duties allocated to a foreman, and he acts as instructor to the pupils.

4. Weaving Department.

There are six looms of Swedish pattern and a warping mill in this department.

The two journey~~men~~women and three pupils work together in the same room under the charge of a sighted Forewoman and an assistant. Although the Forewoman is no longer blind within the meaning of the Blind Persons Act, she has been a blind worker. She learnt the trade at the Barclay Home at Brighton, and then became a worker at the Barclay Workshops for Blind Women in London. Her sight has improved since, and, due to her experience, she received her appointment here. She has brought many valuable suggestions from her store of experience to assist the progress of this department.

Each girl wraps her own material on the warping mill. The mill is propelled by hand, and each girl works the mill approximately one day in fourteen. There are large individual variations of output. The average rate is therefore considerably lower than would be the case if the same individual were continuously employed on the mill. If one person only were so employed, then as soon as she had gained complete mastery of the mill, the girl preparing the warp should be instructed to use four threads at a time instead of two. This would nearly double the output.

All the workers and pupils have been taught to use one foot for the process of weaving. We strongly recommend that in future they be taught to use both feet. This is a more natural movement, and the time required for the pupil to advance is considerably shorter. A considerable proportion of time is spent by pupils using one foot only in looking (or feeling) for the corresponding pedal. It may be necessary to alter the construction of the loom very slightly - raising a beam from two to three inches - in order to permit workers to use their feet freely. There is a considerable amount of side-play permitted in the pedals: this often causes injury to the workers' ankles. To prevent this we recommend the cutting of slots in which the pedals will move.

A noticeable feature with the pupils who were throwing the shuttles was that some of them showed no hesitation, or steadying effect, before the shuttle was actually released. Working on the narrow widths of eighteen and twenty-two inches, the pupils used a clean sweeping movement, but when placed on a loom containing wider material, it was noticed that there was a lack of confidence in throwing the shuttle through the warp. To give greater confidence to workers and to obviate this steadying effect, we recommend a ledge being attached to the hanger. When the shuttle is thrown, it would run on this ledge, and can in no way go through the warp and fall to the ground. This principle of a ledge is the same as that adopted for all looms using fly-shuttles.

Bobbins are wound by weavers. These bobbins are of paper and are made by the weavers by wrapping the paper round a spindle. The thread is then wound round this paper. A definite amount of acquired skill is first required to prepare such a spool. The time required to wrap one was approximately twenty seconds. During the process of weaving, however, the thread occasionally entangles in the bobbin, and prevents the shuttle from proceeding across the warp, thereby causing delay. The shuttle has to be extricated from the warp, and the loose thread unravelled, and then wrapped on to the bobbin. We recommend a type of spool already made, with raised edges on either side. The advantages of such a spool would be as follows.

i. It is ready-made, and the time required to make a spool is eliminated.

ii. The edges of the spool prevent the thread from slipping off and becoming entangled with the warp in the process of weaving.

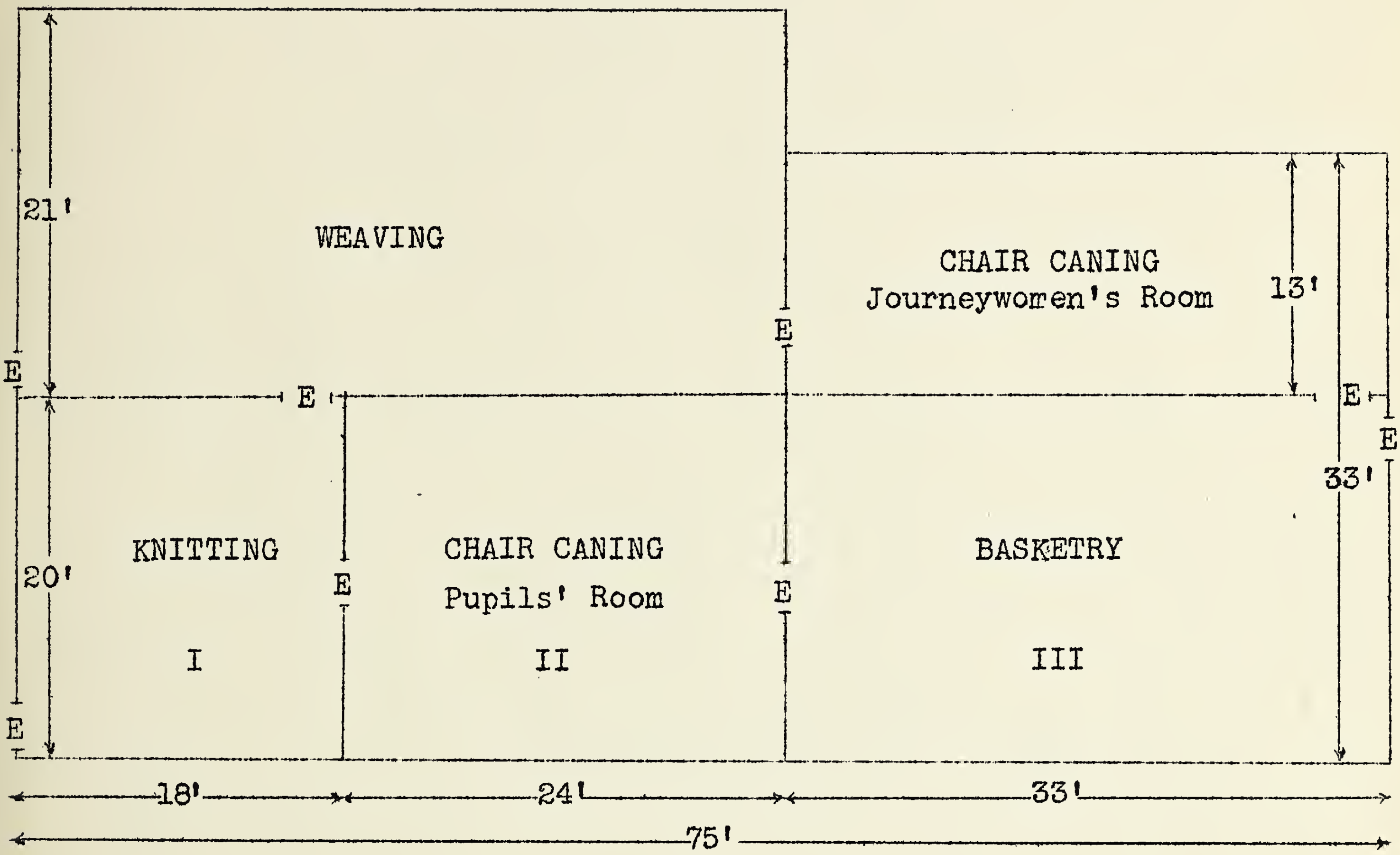
iii. It is simpler to wind wool on a spool of this shape, since its edges act as guides.

iv. It contains a far larger quantity of material than that which is prepared in the department. This produces a garment with a better appearance, since there will be less knots in the finished article.

Immediately these advantages were placed before the Secretary of the Institution, he decided to obtain spools of this type for future use in the department.

5. Knitting.

There are six round machines in this department, and three girls. Each operator winds her own wool. We understand that


WEAVING
21'
CHAIR CANING
Journeywomen's Room
13'
KNITTING
I
20'
CHAIR CANING
Pupils' Room
II
BASKETRY
III
33'
E
E
E
E
E
E
E
E
E
18'
24'
33'
75'

E Entrances

each worker is capable of winding and knitting eighteen pairs of socks (plus the toe) per week. The workers are all totally blind and are paid on a piece-rate fixed by the National Hosiery Union. There are no pupils in the department, nor is there any definite period allocated for training. The trainees would work in the same room as the journeywomen.

A sighted supervisor with a sighted assistant is in charge of the department and of the Chair Caning Department. These two perform all the finishing that is required in these two departments.

6. Chair Caning Department.

There are seven journeywomen and one pupil in this department, and they are under the same supervision as the Knitting Department. Here, again, no definite period is allocated for training. The journeywomen are paid on a piece-rate fixed by the Institution (see Appendix II).

The chairs are placed on a stand sixteen inches above the ground, for the specific purpose of assisting the workers, while seated, to obtain a good 'hold' of their work.

The journeywomen work in a different room from the pupil. The room for the pupils is next to the Knitting Department; the diagram opposite shows the position of the rooms. Since the workroom for chair caning is the same length as that of the Basketry Department, it may be more satisfactory, particularly from a supervisory point of view, to make these two departments exchange rooms. This will then bring the departments in Rooms I, II and III under one supervisor, and, when the doors between each of the rooms are open - as they usually are in the summer months, the supervisors can easily determine if further supplies of raw material etc. are required in any particular room.

7. Basketry Department.

There are two workers and six pupils under one sighted supervisor in this department. The girls are paid on a piece-rate while a training of five years is considered the maximum.

In conclusion, we wish to express our appreciation for the assistance given our investigator: especially do we thank Mr. Alfred E. Cheek, Secretary of the Institution, and his Manager, Mr. L. F. Chester. Every facility was given for obtaining all the data available.

(Signed) G. H. Miles.
For Director.

9th September, 1930.

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APPENDIX I.

Average wages earned by workers in the various trades.

Departments.		Average wages earned per week per worker by: Partially Blind.	Totally Blind.
Basket		22/8¼ (4)	13/2 (10)
Mat.			
Mat Weavers.		26/3 (1)	26/8 (3)
Coal Bag Weavers.		16/2 (2)	13/6 (1)
"Binding and Squaring"		19/4½ (4)	16/- (1)
Brush.			
Drawn.	Male	-	12/11 (3)
	Female	-	6/2 (1)
Pan.	Male	-	24/9 (3)
Weaving		-	14/5 (2)
Knitting		-	8/6 (3)
Chair Caning		-	6/6 (7)
Basketry		11/9 (2)	-

N.B. The numbers in brackets are the number of workers from whose wages the average wage is calculated.

APPENDIX II.

Piece Rates for Ordinary Chair Caning.

Holes.	Caning.	Beading.	Pegging etc.	Total.
16	8d.	2d.	1d.	11d.
17	8d.	2d.	1d.	11d.
18	10d.	2d.	1d.	1/1
19	10d.	2d.	1d.	1/1
20	1/-	2d.	1d.	1/3
21	1/-	2d.	1d.	1/3
22	1/2	2d.	1d.	1/5
23	1/4	2d.	1d.	1/7
24	1/6	2d.	2d.	1/10
25	1/8	4d.	2d.	2/2
26.	1/10	4d.	2d.	2/4
27	2/-	4d.	2d.	2/6
28	2/2	4d.	2d.	2/8
29	2/4	4d.	2d.	2/10
30	2/6	4d.	2d.	3/-
32	2/10	4d.	2d.	3/4
34	3/2	4d.	2d.	3/8
36	3/6	4d.	2d.	4/-
38	3/10	4d.	2d.	4/4
40	4/2	4d.	2d.	4/8
42	4/6	4d.	2d.	5/-
44	4/10	4d.	2d.	5/4
46	5/2	4d.	2d.	5/8

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

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STUDY

Report of Investigation

AT

OF

THE ROYAL MIDLAND INSTITUTION FOR THE BLIND,
CHAUCER STREET,
NOTTINGHAM.

Period : 14th - 26th July, 1930.
Investigator: C. B. Fox.

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II. GIRLS' DEPARTMENT.(pp.2 - 10.)

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III. MEN'S DEPARTMENTS.(pp.10 - 16.)

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APPENDIX I : AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

APPENDIX II : WASTE DUE TO ALLOWANCES FOR SHRINKAGE OF GARMENTS.

APPENDIX III : COPY OF COST CARD FORM.

APPENDIX IV : RELATIONSHIP OF "GENERAL EXPENSES" TO COST OF MATERIALS AND MAKING A GARMENT.

I. INTRODUCTION.

A visit was paid to Nottingham to study the trades conducted at the Royal Midland Institution for the Blind, and, in particular, to determine if there are any local conditions which are likely to affect the basic methods of basket making and knitting. An account of these methods is being prepared for the bulletins of the National Institute for the Blind.

The Institution is fortunate in possessing a compact building in which pupils, journey~~man~~men and journeywomen work. The provisions for pupils, such as the hostel etc., are excellent and every endeavour is made by the management to ensure congenial working conditions. The walls and ceilings of the workrooms are whitewashed and workers are usually placed under the windows, so that sighted and partially sighted workers may receive full advantage of the daylight.

In addition the Institution has a great number of 'home workers' and especial care is taken to provide every facility for them. There is also an 'after care' department, which is effectively operated.

Where possible workers are paid on a piece rate. Appendix I shows the average weekly wages earned in each trade. Figures have been recorded for a period of four weeks ending on the 12th July 1930, and only full working weeks have been taken into consideration. The hours of work per week differ for men and women; the former work forty-eight and the latter forty-two hours per week.

The method of paying augmentation to workers is as follows. Augmentation of 15/- is paid to workers who earn up to 10/- per week. The augmentation is then decreased by 3d. for every shilling earned above 10/- per week, until the augmentation is 5/- per week. At this figure the wage earned is 50/- per week. Thereafter, the augmentation is constant at 5/- per week.

II. GIRLS' DEPARTMENT.

The girls' department is composed of several rooms on the ground and first floors. Here the following trades are conducted.

1. Knitting.
   - i. Flat machines.
   - ii. Round machines.
2. Weaving.
3. Chair Caning and Basketry.

There is, however, only one room in which workers are employed. Pupils are taught these trades in the other rooms.

1. Knitting.

i. Flat machines. In the workroom there are two flat machines, one round machine, and two weaving looms. Of the two flat machines, only one was in use throughout the period of the visit. One is an 8-gauge machine, and the other a 7-gauge. The operator of the 8-gauge machine produced some exceptionally good work from it. It is a fairly modern type of machine, supplied by Messrs. Dubied & Co., of Leicester, and has braille numbering for every tenth needle. It has also an attachment to indicate in braille the number of rows performed by the operator. It thereby eliminates the necessity for the girl to count the number of rows, and it must be of considerable assistance to the worker in concentrating on her remaining work. We wish to draw attention to this indicator, particularly since it is the only one we have seen in any of the blind institutions conducting work in the knitting trade.

The worker on the machine winds her own wool, and on completing a garment she unwinds (from the bobbin) the remainder of the wool in order to release the bobbin for winding other materials. By permitting the worker to wind and unwind wool, the department is not obtaining maximum production time from the knitting machine. Timings of this work would probably show that the Knitting Machine is in use for no more than fifty to sixty per cent. of the total available time.

Again, should the knitter 'run off' her work owing to lack of wool on the bobbin, all the material that has already been worked upon is taken off the machine and unravelled, and the whole work is re-commenced. Some of the wool is not used again. This system has been introduced in the department on grounds of necessity, since there are no whole time sighted supervisors in the workroom. If, however, a sighted supervisor was continuously employed in this room, the material could easily be picked in, and all the work already performed would be saved. It is difficult to estimate the probable cost of the loss entailed by unravelling work already done. But the loss due to the absence of a sighted supervisor is two-fold.

i. The time taken to knit the material 'run off' is lost, both to the worker and to the Institution.

ii. Material is wasted, since some of it is not used again.

If the rooms of the Girls' Department were re-allocated, provision could easily be made for one of the teachers with a few pupils to remain in the same room as the workers. The teacher could then pay specific attention to both pupils and workers, and this two-fold loss would be avoided.

ii. Round Machine. The round machine is of the usual pattern used in most blind institutions where knitting is conducted. The worker on the round machine in this room winds her own wool

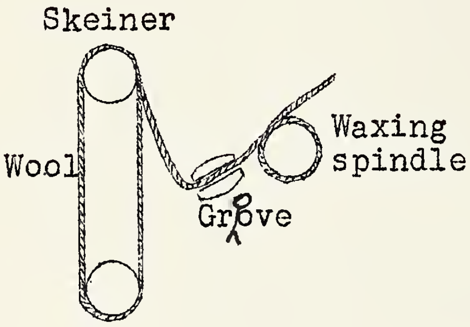

Figure I.

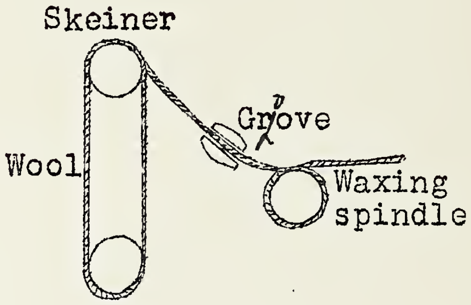

Figure II.

and is capable of winding and knitting six pairs of socks (without toes) per day. If her wool was wound for her, she could work her machine continuously, and would thereby increase her output considerably. Since there are already two rest pauses of ten minutes each during the day, this should not have any deleterious effects upon her.

iii. Bobbin winding. Bobbin winding is performed by hand by each knitter. Small difficulties were experienced in this process, and were the cause of frequent breakages of the wool. The teachers have now been shown that the wool must be wrapped round the waxing spindle but inside the metalled groove, and that the wax should be on only one side of the wool. This will permit of smooth running, and will not tend to break the wool. A supply of wax should always be available to replenish the used piece on the waxing spindle.

The spring wire to keep the wool at a definite tension should not be tampered with, while the groove through which the wool has to pass should be approximately in a straight line with the skeiner and the waxing spindle. If the groove is in the position as in Figure 1 opposite, there is a tendency for the wool to break. This was the angle of the groove during the period of the visit. Figure II shows the correct angle of the groove. These apparently minor points should be given every attention.

Since, however, there are approximately seventeen pupils for round machine work, and since ~~these~~ some pupils are capable of producing saleable products, it would be advantageous to employ an automatic bobbin winding machine of six spindles. This machine should be worked by a sighted operator. It would then be able to supply both workers and pupils with all their material and keep them continuously employed. This machine is somewhat expensive, but it would justify its purchase if the Institution decides to extend the department's activities - a question of policy which must be faced in the immediate future.

iv. Allowance for shrinkage. The finishing, pressing, cutting and shaping on the overlocking machine of the garments made on the flat machines is performed by the teachers. Garments are not shaped on the knitting machines. A singular feature about this department is the small quantity of waste that is made. Although the range of colours is wide, only two types of wool are used. The assistant in charge has developed a simple method to allow for shrinkage of the material when taken off the flat machines. She measured several shrunk garments and noted the number of rows to the inch in both types of wool, 2/16 and 2/28.

The measurements were

7-Gauge machine - Work with 2/16 wool. Rose Fingering. Tension 13.

Fourteen rows to one inch in length.

Ten needles to one inch in width.

8-Gauge machine - Work with 2/28 wool. Rose Fingering. Tension 12.

Eighteen rows to one inch in length.

Twelve needles to one inch in width.

When issuing instructions to prepare a garment of any length in inches, she multiplies the number of rows in an inch by the number of inches required, and adds about twelve rows to allow for any error.

The soundness of this method has been revealed in practice. No garment varied more than 1¾ inches from the required dimensions. The figures shown in Appendix II give the variations. But the knitters did not adhere strictly to these instructions - particularly the knitter who worked on 2/16 wool. Had they done so, the variations would have been even less. The wider variations may be due partly to non-adherence of instructions on the part of the knitters, and partly to the fact that these garments had been knitted some considerable time before, and had been left rolled up in the basket to be finished. This had made several creases in the material, making the measuring of the garments somewhat inaccurate.

2. Weaving.

i. Warping Mill. There is a warping mill which is placed in one of the pupils' rooms and is operated by a blind and deaf girl. She performs her work with great speed and accuracy, using two threads at a time. The mill, unfortunately, has to be propelled by hand, but ~~since~~ this girl is ~~continuously~~ the only one employed on it, and she has attained a considerable amount of skill at this work. Since she is always ready to learn new methods of work etc., we recommend that she be taught to use four threads at a time. This would nearly double her output.

ii. Weaving. Weaving is performed in the workroom on two looms of Swedish pattern. Both operators are fairly elderly and would not be amenable to change. In dealing with pupils, however, we strongly recommend that they be taught to use both feet. This is a more natural movement (it is only operators who have been using one foot for years who consider that the use of one foot is more natural, and they are apt to overlook the beginner's stage) and the time required for the pupil to advance in speed is considerably shorter. A considerable proportion of time is spent by pupils who use one foot only, in looking (or feeling) for the corresponding pedal. We strongly recommend that all pupils be taught to use both feet in weaving.

When throwing the shuttle, the workers hesitate until they are sure the shuttle will go between the warp. Both workers steady each throw before releasing the shuttle. The time lost here is approximately one-fifth of a second for each throw, but it was difficult to estimate. Since an operator requires twenty-four seconds to throw the shuttle ten times for a material twenty-two inches wide, (nine thousand throws in a working day of six hours) there is a loss of thirty minutes per day. The utilisation of this time would increase the number of throws by seven hundred and fifty per day - an increase of 8.3 per cent. We therefore recommend that every effort should be made to eliminate this hesitation on the part of the workers in the beginner stage. It is due to a lack of confidence in their ability to throw accurately.

To give the beginner greater confidence, we recommend that a ledge be attached to the bottom of the banger, the bottom threads of the warp lying on the ledge. When the shuttle is thrown, it will run on this ledge, and can, in no way, go through the warp and fall to the ground. The principle of such a ledge is the same as that adopted for all looms using fly-shuttles.

The bobbins are wound by the weavers. They are of paper, and are made by wrapping the paper round a spindle. The yarn is then wound round this paper. During the period of the survey of this department no bobbins were being made, but we are of opinion it requires at least ten seconds to make a spool. There is a considerable amount of acquired skill necessary to make a bobbin on such a spool; but even after this skill has been acquired, trouble is occasionally caused during weaving. The thread entangles on the spool and prevents the shuttle from proceeding across the warp. This causes a delay to disentangle the shuttle from the warp, and to unravel and re-ravel the loose thread. A type of wooden spool with raised edges was tried by the weavers, and both workers and management are of opinion it would be beneficial. The advantages of this spool are three-fold.

i. It is ready-made, and only requires the thread to be wound on to it.

ii. The edges prevent the thread from slipping and becoming entangled with the warp.

iii. It is simpler to wind wool on such a spool since its edges act as guides for making the bobbin.

The wooden spool will hold a greater quantity of material than the paper spool. The management have decided to obtain wooden spools for future use.

3. Chair Caning and Basketry.

There are no workers in this section, although there are about twelve pupils, who are being taught the work. All the pupils undergo a course of training in all three sections (knitting, weaving and basketry). Those pupils who desire to become fancy basket-makers are transferred on the list for 'home-workers' immediately the pupil stage is over. Four years is considered the maximum period of training for all three trades.

Every endeavour is made to sell any well-made articles during the period of training. Considerable quantities of socks etc. are sold in this way.

4. Costing of Articles Manufactured.

Appendix III is a copy of the form used for costing the articles manufactured in the knitting and weaving sections. The first item includes the cost for winding the material on bobbins and for knitting (or, weaving), a piece-rate being paid for this work.

All articles require finishing, but in many instances of pupils work this has been omitted as a charge. If a garment costs 7/- for the first two items, 1/3 is debited against "General Expenses" to cover overhead expenses. The amount placed under this heading bears no relationship to items 1 and 2. The nearest relationship this figure bears to the preceding figures is to items 1 and 2 combined. But it will be seen from Appendix IV, where the column headed "Cost of Material and of Making a Garment" represents the sum of items 1 and 2 of Appendix III, that the sum entered under "General Expenses" is not dependent upon the cost of material and of making. In items 7 and 9 of Appendix IV the costs of material and of making are the same (9/10), but 1/6 is added to general expenses in the first case, 2/- in the second case. From this it seems clear that the figure for general expenses is not based on any definite data. In dealing with problems of costing, we urge the management to consider this question in much more detail, and to obtain exact values of the cost to manufacture articles, in order that more accurate figures may be obtained to determine the actual profit or loss occurring in the running of the department.

5. General Policy.

The future of these trades - particularly of knitting and weaving - depends upon the general attitude of the management of the Institution. Innumerable articles have been well made and some of them are being stocked on the premises. The indication to the public that these articles are manufactured here is given through the Retail Shop, a Travelling Sales Van and at displays at bazaars etc.

Throughout the country there has been a growing tendency on the part of the public to appreciate and to demand knitted garments made by blind institutions.

The trend of the fashion has been towards closely knitted garments made on 10- and 12-gauge machines. The worker now employed on the 8-gauge machine should be able rapidly to master the 10- or 12-gauge machine.

The management of these departments has through our investigator been introduced to a Company in Nottingham which manufactures artificial silks and weaving cottons, and which supplies the principal knitting workshops employing blind labour. This introduction will be of great benefit. Through dealing with a local Company, the Institution will now be able to obtain a quicker supply, and at a very much cheaper rate. For artificial silk has been bought at prices varying from 9/6 per lb., but this Company charges 5/6 per lb. An even greater advantage results from their willingness to accept the return of unwanted artificial silks to re-dye to any colour the Institution desires.

III. MEN'S DEPARTMENTS.

1. Basket Department.

There are thirteen workers in this department: eleven of these are in one room, while the remaining two are in a section by themselves. The room containing the eleven workers is large and spacious. The walls and ceilings have been washed white, and there are nine large windows on both the long sides of the room; sighted and partially-sighted workers are thus given full advantage of the daylight. The journeymen, as is customary in this trade, work with their backs to the wall. Each worker has ample accommodation.

There is ample floor space in the centre of the room. Some of this is taken up by a small storage of white cane, and by storage of some of the baskets already made. These baskets, when piled on each other, have been known to be as much as six feet high. This reduces the advantages that can be obtained by daylight in this room.

Each worker has a plinth, about fifty-four by forty-two inches, on which he places his work. The worker sits at various times on stools of two different heights, one being but six inches high while the other stands thirteen inches high. The type of work conducted in this department is general square work. Work was in progress on a large contract of bicycle carrier baskets at the time of our visit.

It is peculiar to this department that some of the workers use a metalled frame as a guide. This is of considerable assistance in the preparation of a basket, particularly in the beginners stage.

There are two tanks for soaking material, one for cane and the other for brown willow. Both tanks are outside the room, but under cover. The former is near the workroom, while the latter is about twenty-five yards distant. The space between the workroom and the tanks is not under cover. Workers fetch their material from these tanks.

There is a Foreman, who is assisted by a sighted finisher and an assistant finisher. The assistant finisher is partially blind. The sorting of cane is performed by the finisher, though each journeyman sorts brown willow. The stakes are cut by the journeymen.

The workers are paid on a piece rate determined by the British Amalgamated Union of Basket Makers.

The pupils are taught in a room adjoining that of the journeymen. There is a sighted instructor in charge of the twelve pupils. The ~~minimum~~ usual period of training for this trade is four years.

2. Mat Department.

Here the usual articles produced are the ordinary mats, such as singles, doubles etc., wool bordered and wool mats, kneeling mats and coal bags.

The raw material is received in bales and broken up by a totally blind man, who winds the material on to bobbins. This worker is paid on a time wage. Some of the bobbins are then taken upstairs into a small room twenty by twelve feet, where the material is warped. The warping mill is operated by a totally blind man. The material is then taken off the mill and brought back to the room where the original winding is performed. Here the material is beamed by the assistance of a motor. The space used for beaming is approximately nine yards long. The operation can, however, be performed within less floor-space. The majority of the material for weaving in the Girls' Department is beamed here.

Sixty-five yards of coir matting were beamed in four and a quarter minutes, and approximately fifty yards of cotton in thirteen minutes. The latter time would have been considerably reduced if the thread had been wrapped round the warping mill correctly.

The beam containing the material is then placed on the loom for the weaver. There are fourteen looms, and these are in a large room adjoining that in which the bobbins are wound. The weavers are paid on a piece-rate fixed by the British Coir Mat and Matting Association.

After weaving, the mats are squared by two sighted workers paid on a time wage, and then bound. They are combed and sheared on a machine (in the same room as that used for bobbin winding), by a sighted assistant. The efficiency of the exhaust fan in extracting the fluff etc. was particularly noticeable in this process: very little, if any, mat dust remained in the room. The diameter of the fan is about two feet, and it revolves at the rate of two thousand revolutions per minute.

Plaiting is performed by hand in a room adjoining that containing the warping mill. The plaits are added to the kneeling mats, which are made in the main room containing the looms. This completes the process in the manufacture of kneeling mats.

Sinnet mats and coal bags are also made in the main room.

There is a Foreman with two sighted assistants in the department. One of these assistants has been a partially sighted worker in the department, but his eyesight had so improved that he no longer came within the regulations of the Blind Persons Act. His sight, however, is gradually deteriorating.

Training is conducted in the department, where a period of four years is considered the maximum. The training also is under the supervision of the Foreman. It is the object of the Foreman to teach every worker all of the various processes in his department. There are three pupils.

3. Brush Department.

This department deals with both pan and drawn work, but in contrast to most other brush departments employing blind labour, women are engaged here on pan work, so that there are men and women employed in both types of work. The women, of course, are separated from the men.

There are three sighted men who bore the holes in the stocks for pan work, and they also inspect and finish the brushes. For the drawn work, however, two sighted girls and two partially sighted men are employed for boring the holes in the stocks, and for general trimming etc.

All the workers are paid on a piece rate, which is a little more than that fixed by the British Board of Trade Rates.

In addition to the ordinary scavenger and rotary brushes for pan work, and the ordinary type of brush for drawn work that are usually made by Blind Institutions, there are numerous other brushes made. The designs etc. had been invented by the Foreman, who had a vast store of knowledge of the trade. A notable feature was the manufacture of a type of drawn brush by two semi-automatic filling machines. These machines were made by Messrs. B. W. Clegg & Son, of Leeds.

As a method of indicating which workers are responsible for poor work, identification marks are placed on the backs of the brushes.

Pan Work. There are five pans in the room for men, and one for women. The endeavour was to place six workers to each pan, though the Foreman is of opinion that, on account of lack of space on the table, it was advisable to employ only four. The accommodation appeared to be less than that allotted to workers in other blind institutions. The table is hexagonal in shape, having a diameter of fifty inches, while the diameter of the pan is sixteen inches. The width of table allowed is thus seventeen inches.

Each worker is given a lump of 'whitening' to rub on the back of the brush and on to his hands in order to prevent the pitch from sticking.

Special instructions are issued here to the workers to pay particular attention to the first dip in the pan. That portion of the material which is dipped should be spread so that every fibre comes in contact with the pitch. This is the first essential in pan work if good brushes are to be made, and it is because this care is given at Nottingham that the Institution has a reputation for good brushes.

The variations in output of the journeymen in this work were very noticeable. Appendix I shows that the average wage of a pan worker is £1. 7. 3 per week. At the same time there are two workers who are in receipt of approximately £2. 10. 0 per week each.

A most important feature in this work is the method of extracting the pitch vapours from the room. It is done by an exhaust fan which removes the vapours through pipes below the room. There is very little trace of vapour in the room, which indicates the efficiency of the installation. Prior to the installation of this method, overhead cowls were in use, but several workers complained of "lung trouble" due to the presence of these vapours, and many asked for transfers to drawn work. The new method of extracting the vapours from below has reduced the sickness return considerably, and has made conditions far more congenial.

The training is conducted in the workshops where a period of three years is considered the minimum for both men and women. We are of opinion that the training for these two branches of this trade should be more carefully considered in all blind institutions.

4. Boot and Shoe Repair Department.

This is a department on the ground floor. Neither boots nor shoes are made here. The leather is purchased, cut up by the sighted supervisor, and given to each worker. This supervisor also acts as instructor for the fifteen pupils.

There is only one journeyman, and since a proportion of his time is spent in conveying repaired shoes to the owners, etc. he is paid on a weekly basis of £2.2.0 including augmentation.

Again there is no definite method of indicating to the public that this trade is conducted at the Institution. If this department was advertised, through the agency of the retail shops, the pupils' working hours would be more fully occupied.

5. Preliminary Department.

All male pupils on arrival are engaged in a preliminary stage on chair caning and rush seating. When accommodation is available in any of the departments, they are drafted to become pupils in a definite trade. The department is under the supervision of a partially sighted worker, who is in turn under the Foreman of the Basket Department. The reason for the establishment of a preliminary training is to make the fingers of the pupils supple and accustomed to work which requires finger manipulation, so as to prepare them for the actual training in a definite trade.

In conclusion, we wish to express our appreciation of the assistance given to our investigator by the entire staff of the Institution, and especially thank Mr. M. Priestley, the Superintendent and Secretary of the Institution, and his assistant, Mr. R. C. Fanthorpe. Every facility was given to obtain all the data necessary to produce results which we are sure will be beneficial, in time, to the blind.

(Signed) G. H. Miles

9th September, 1930. For Director.

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APPENDIX I.

AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

Departments.		Average wages earned per week per worker by	
		Partially Blind.	Totally Blind.
Basket		32/1 (3)	30/8 (7)
Brush. Pan Work.			
	Men.	27/- (12)	27/11 (5)
	Women	14/9 (1)	-
Drawn Work.			
	Men (Suffers from poor health)	6/2 (1)	24/9 (2)
	Women	11/6 (2)	13/4 (2)
Mat		21/1 (4)	21/- (5)
Knitting		15/2 (1)	22/5 (1)
Weaving		12/2 (2)	-

The numbers in brackets after each average wage denote the number of workers employed.

APPENDIX II.

WASTE DUE TO ALLOWANCES FOR SHRINKAGE OF GARMENTS.

Article	Length Made. (Inches)	Length Desired. (Inches)	Difference (inches)	
			Too Long.	Too Short.
		2/28 Wool.		
Jumper	26¾	26	¾	-
Sleeve	22	22	-	-
Skirt	24⅞	25	-	⅛
Skirt	25¼	25	¼	-
Jumper	26½	26	½	-
Sleeve	22¾	22	¾	-
Jumper	27	26	1	-
Sleeve	22¾	22	¾	-
Skirt	25¾	25	¾	-
Jumper	26¾	26	¾	-
Sleeve	22½	22	½	-
Skirt	24	25	-	1
		2/16 Wool.		
Jumper	27¾	26	1¾	-
Sleeve	24½	22	2½	-
Jumper	26	26	-	-
Sleeve	22¼	22	¼	-
Skirt	24	25	-	1
Coat	28	29	-	1
Sleeve	23¼	22½	¾	-

APPENDIX III.

COPY OF COST CARD FORM.

	Name	
(Item 1)	MAKING - (Worker's name given here) (cost for MAKING)	£- - -
(Item 2)	MATERIAL -(Type) wt. lbs. ozs. at - per lb (cost)	- - -
	Finishing) Sewing up etc.)	- - -
	Winding Spools	- - -
	Making Warp	- - -
	Setting up	- - -
	Beaming	- - -
	Waste	- - -
	General Expenses	- - -
		£

Details.

(Description of article required mentioned here.)

APPENDIX IV.

RELATIONSHIP OF "GENERAL EXPENSES" TO COST OF MATERIALS AND MAKING A GARMENT.

	Cost of Material and of Making a Garment.	General Expenses.	Relationship. ("General Expenses" as a percentage of "Cost of Material and of Making a Garment".)
1.	7/-	1/3	17.9%
2.	6/-	1/-	16.7%
3.	7/9	1/3	16.1%
4.	8/10	1/4	15.1%
5.	11/7½	2/8	22.9%
6.	19/6	3/6	17.9%
7.	9/10	1/6	15.3%
8.	16/4	3/-	18.4%
9.	9/10	2/-	20.3%

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

R295

Report of ~~Investigation~~ SURVEY

OF ~~AT~~ THE

HAYESLEIGH WORKSHOPS,
HENSHAW'S INSTITUTION FOR THE BLIND,
OLD TRAFFORD,
MANCHESTER.

Period : from the 11th to the 23rd August, 1930.
Investigator: C. B. Fox.

I. INTRODUCTION. (pp. 1, 2.)

II. TRADES CONDUCTED AT THE HAYESLEIGH WORKSHOPS. (pp.2 - 14.)

1. Weaving Department. (pp.2 - 6.)
2. Knitting Department. (pp.6 - 8.)
    - i. Flat machines. (pp.6,7.)
    - ii. Round machines. (p.7.)
    - iii. Bobbin winding. (pp.7,8.)
3. Basketry Department. (p.8.)
4. Upholstery and Chair Caning Department. (pp.8,9,)
    - i. Upholstery section. (pp.8,9.)
    - ii. Chair caning section. (p.9.)
5. Boot and Shoe Department. (pp.9,10.)
6. Brush Department. (pp.10,11.)
    - i. Pan work. (pp.10,11.)
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7. Mat Department. (pp.12,13.)
8. Basket Department. (pp.13,14.)

III. FURNITURE DEPARTMENT. (pp.15,16.)

- i. The machine shop. (pp.15,16.)
- ii. Assembling section. (p.16.)
- iii. French polishing section. (p.16.)

APPENDIX I. Average Wages Earned by Workers in the Various Trades.

I. INTRODUCTION.

A short survey was made of the trades conducted at the Hayesleigh Workshops belonging to Henshaw's Institution for the Blind at Old Trafford, Manchester.

The workshops are situated some 600 yards from the main institution and were erected about five years ago. A noticeable feature in the building is the extent of the window-space which is approximately seventy-five per cent. of the entire area of the sides of the building. The ceiling of the shops is whitewashed. Ample accommodation is provided for the workers, though there will soon be a demand for additional floor space, owing to increases in the activities of all departments.

The trades conducted at these workshops are originally taught to the blind at the main institution. After having satisfied the authorities of their abilities, the workers are sent to the workshops as 'improvers' until a definite standard of efficiency has been obtained. They are then transferred to the list as journeymen or journeywomen.

It is the desire of the management to pay as much as is possible of the work by piece rates. Appendix I shows the average weekly wages earned in each trade. The figures have been taken to cover a period of four weeks, and only full working weeks have been taken into consideration. Owing to unemployment, the actual period taken varied for each department. The hours of work vary between the men and the women, the former working forty-five hours per week, the latter forty. Both men and women have a fifteen minutes' break in each of the morning and afternoon sessions. A significant feature is that work is done on only five days in the week. This innovation came into force some three months ago, and we understand the output per week per worker has diminished very slightly indeed. Previously the men worked forty-eight hours and the women forty-three hours per week.

The method of paying augmentation to workers is as follows. Augmentation of 22/- is paid weekly to men who earn up to 22/- per week, and 19/6 is paid weekly to women who earn up of 12/- per week. Thereafter, the augmentation is decreased by 3d. for every shilling earned above these limits.

II. TRADES CONDUCTED AT THE HAYESLEIGH WORKSHOPS.

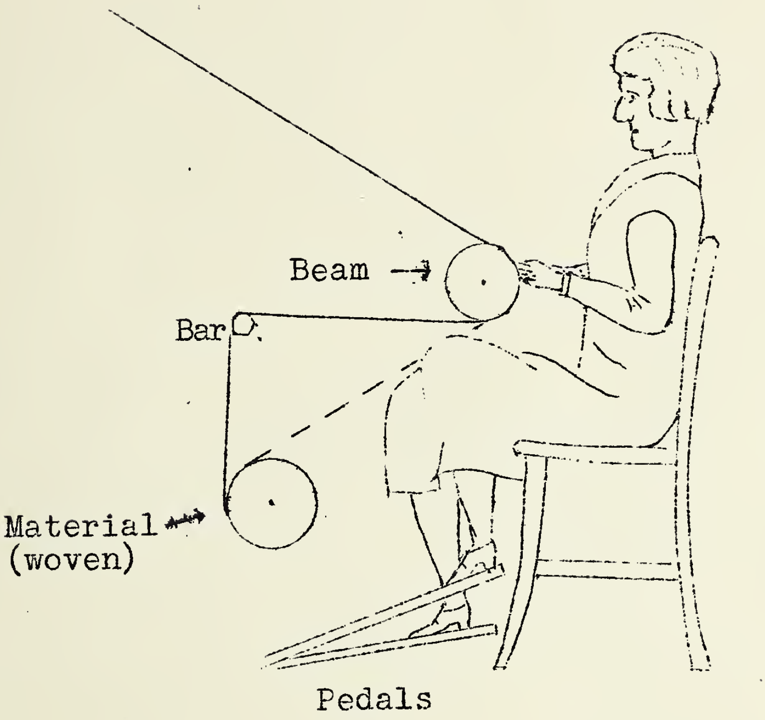
1. Weaving Department.

There are six looms of Swedish pattern and two warping mills in this department, though only only one mill is used.

The warping mill in use is worked by a partially sighted girl. The mill is similar in pattern to the type of mill used in other blind institutions, but it has in addition a device on the guide for changing the thread over the pegs on the mill. This permits working twelve threads of the same colour at any moment, as compared to the two threads used in other institutions. The time, however, taken to prepare a warp of approximately thirty yards length using twelve threads at a time is about eight hours.

The mill is hexagonal in shape with an inner diameter of forty-seven inches. The lengths required are prepared by wrapping the thread round the mill a definite number of times, determined by the usual calculations. The warp is then wrapped round a drum direct from the mill, and later 'beamed'. The beaming is performed by hand.

All the looms are of Swedish pattern, though a noticeable feature was that the bar over which the woven garment is expected to be placed before it is actually wrapped round the beam has been removed from every loom. By removing this bar,


Beam
Bar
Material
(woven)
Pedals

the woven material now descends directly on to the beam which receives it, and so reduces the space between the material and the pedals (see sketch opposite). In consequence, the knee of the worker frequently bangs the material. In some cases this banging into the woven cloth is continuous, and there is evidence of it on the finished product. We therefore recommend that the bar be replaced. In preparing mattress ticking, the indentations are not so important, since the ticking undergoes other processes before final completion: but they are very undesirable on other materials that are made on the looms, such as table cloths, towels, etc. The absence of the bar, moreover, prevents the girl from using two feet in the process of weaving. With the present system, the workers are compelled to use only one foot, and it is probably on this account that the use of one foot is only taught. A considerable proportion of time, however, is spent by pupils looking (or feelingly) for the corresponding pedal when only one foot is used. The use of both feet is a much more natural movement, and the time required for the pupil to advance is considerably shorter by this method. In view of these points, we strongly recommend that the bar be placed above the beam receiving the material, so as to permit free movement of the legs.

There is a considerable amount of side-play permitted the pedals, which often results in workers injuring their ankles. To prevent this, we would recommend that slots be provided in which the pedals can operate. This may also tend to increase the output, but it will certainly free the worker from all thoughts of injury to her ankles.

The spools on which the cotton is wound for the process of weaving are of paper, and a definite amount of acquired skill is required to prepare them. A spool with edges on either side has been shown to the management. Such a spool has several advantages.

i. It is ready-made: no time is occupied in making it.

ii. Its edges prevent the thread from slipping off and becoming entangled with the warp in the process of weaving.

iii. It is simpler to wind material on a spool of this shape since its edges act as guides.

iv. It contains a larger quantity of material than that prepared in the department. This in itself results in a garment with a better appearance, since there will be fewer knots.

We strongly recommend that such spools be adopted for future use.

The most important feature in the weaving department was the use of a loom with a fly-shuttle. Unfortunately, the fly-shuttle had been fixed on one of the older type of looms. The 'banger' was hinged to the bottom of the loom and not to the top, as it is in the more modern Swedish pattern looms. The reed appeared to be placed too high up in the loom. In consequence, when a pedal was depressed to open the warp for the shuttle to pass through, the warp could not open more than 1⅜ inches. The top-most part of the warp reached to within 1⅜ inches of the reed of the 'banger'. In the looms having the 'bangers' hinged from above. The position of these 'bangers' can be raised or lowered so as to permit the warp to open to its widest possible distance. On such looms, the warp opens at least 2¼ inches. If a warp opens only 1⅜ inches as in the case of the loom with a fly-shuttle, there is a tendency for the fly-shuttle to penetrate through some of the threads in the warp. This is exactly what occurs. To improve this loom, we advocate the raising of the 'banger' by one inch in order to permit the warp to open to its fullest extent.

We understand from the management that the output obtained from this fly-shuttle loom is no greater than that obtained from a loom on which the shuttle is thrown by hand. By observation, however, there appeared a distinctly quicker rate of work on the fly-shuttle loom. Time studies were taken and these revealed an average of 22.36 seconds for ten throws on the hand looms. Timings on the fly-shuttle loom showed an average of 20.4 seconds for ten throws. The day these timings were recorded was only the second day the worker had ever manipulated a fly-shuttle loom. A week later, however, timings were again taken, and these showed an average of 17.7 seconds for ten throws, or an increase of 26.3 per cent. on the output obtained from hand looms. (Individual differences are not taken into consideration.) The output on the hand-shuttle looms for forty-two-inch wide material averages approximately two and a half to three yards a day.

We desire to record the fact that the girl on the fly-shuttle loom, after her first day's work, expressed the desire to return to a hand-loom. At the end of ten days' work, however, she had a decided preference for the fly-shuttle loom.

Since this Institution is prepared to experiment with the looms, we recommend yet another alteration in the construction of the looms. In the majority of cases, workers actually weave for approximately three minutes, and then they have to leave their seats to 'let down' from one beam and to 'take up' on another. This frequent break-after every three minutes' work - does not permit the worker to attain a definite optimum rate of working. The workers themselves have acknowledged that it prevents them from "getting into their stride". In view of this, we recommend that a device be attached to the looms which will automatically 'let down' and 'take up' and which will thus permit the worker to attain her best rate of working. This device is attached to the fly-shuttle looms and works satisfactorily.

A further interesting feature in this department is that no sighted person is employed as a finisher. All mistakes are rectified on the looms - even those necessitating the opening out of several inches of material. A Forewoman, who is also in charge of the knitting department, acts as a continuous supervisor, in order to detect the errors as soon as they are made.

There is ample accommodation in this department. The main type of article manufactured here is ticking for mattresses. These tickings are supplied to the workshops upholstery department, and, we understand, are manufactured at a lower figure than those which can be obtained outside the factory.

The pupils are trained at the Institution, where a period of two years is considered the minimum. The journeywomen are paid on a piece-rate fixed by the Workshop.

2. Knitting Department.

Here both Flat and Round Machines are worked.

i. Flat machines. There are, in all, thirteen flat machines. Of these five are 10-gauge, while the remainder are 7-gauge.

The operators wind their own wool before they actually begin the process of knitting. Each operator winds her own wool because the bobbin winding machine is unable to wind the fine quality wool (2/28) worked on these machines. This seems unfortunate, since the winding machine is not in continual use. If arrangements could be made to wind this wool by machine, the amount of time spent by operators in winding could be utilised in actual production on the knitting machines. Considerable savings could be effected in this way with a consequent increase in output.

The knitting machines are mostly of the Dubied type. All have Braille numbering for every tenth needle. The 'picking-in' is performed by the sighted Forewoman, who is also in charge of the weaving department. A special device is placed on these machines by which the blind operator can change the tension on the machine herself. This device is of especial interest in the study of the princples underlying this trade.

Three sighted finishers are employed for cutting, shaping and pressing the garments. We understand that the waste is negligible in this department, but no detailed figures are available.

ii. Round machines. There are twenty-two round machines on which socks and stockings are knitted.

All the wool for these operators is wound on twelve-inch bobbins by the bobbin-winding machine. No difficulty is experienced here in knitting on these machines from a twelve-inch bobbin. Too much wool is sometimes wrapped on the bobbins, and they become 'soft-nosed'. Although the departmental charge-hand states that this is not injurious to the finished product, we strongly recommend that this practice be discontinued. We recommend that not more than one pound of material should be wrapped on any twelve-inch bobbin. Sufficient stress cannot be laid upon the importance of proper winding of the wool on a bobbin if a good article is to be knitted. The makers of bobbin winding machines also stress this point, and recommend that only one pound of wool be wound on this type of bobbin.

A sighted girl is in charge of this section: she attends to any of the difficulties experienced by the workers on the machines, and performs a continuous inspection of the material.

The stockings are pressed by a partially-sighted worker. A noticeable feature in the pressing is that since the ironing is performed by electricity, a red bulb is lit to indicate to the workers when the current is on. This is the practice observed in most hosiery firms employing sighted labour. The management state that considerable reductions in the cost of electricity have resulted from this procedure.

iii. Bobbin winding. There is a power-driven bobbin winding machine of six spindles. This machine, however, only winds the coarser material for the round machines. Often it is not in use. A partially sighted girl operates the machine. This duty has been allocated her since she has been found somewhat incapable of earning a livelihood at any of the other trades conducted at the workshops. Owing to her many limitations, full use is not made of the bobbin-winding machine. We noticed this girl place three or four hanks of wool on the same skeiner of the machine, causing entanglements and, ultimately, fracture of the wool. We recommend that she be instructed to place only one hank at a time on the skeiners.

A special feature to be noted here is that the wool is not waxed. White oil has been found an equally good substitute, at a cheaper price.

The workers are taught to operate either flat or round machines, and a period of two years is considered the minimum for the training. All the workers on machines are paid on a piece-rate fixed by the workshop.

3. Basketry Department.

There are five girls making fancy baskets, and they are employed in the room containing the weaving looms. Their work is inspected, after completion, by the Foreman in charge of the men's Basket Department. The material is supplied to them, while a small tub containing water in which they soak their materials, is placed in the room.

Two years is considered the minimum period of training for this trade. The workers are paid on a piece rate fixed by the Lancashire and Cheshire Skip and Basket Makers' Association.

4. Upholstery and Chair Caning Department.

Approximately ten girls are employed in this department, and they are capable of working in both sections. They are trained in both trades, the minimum period for which is three years.

i. Upholstery section. The mattress ticking made in the weaving department is brought to this section after special treatment. Here, the ticking is marked out in pencil by the sighted departmental charge. The sewing is then performed by a sighted operator on an electrically driven machine to make the cases for the mattresses. These cases are filled by hand by the blind girls. Great care is taken to ensure that the mattress is filled uniformly, and that a similar quantity (by weight) of filling is placed in each mattress. They are then sewn up except at the 'mouth', which is left open until the departmental charge has inspected the mattress to determine if any more filling is necessary. The 'mouth' is usually sewn by the sighted operator. Mattresses are filled with hair, flock, etc., while the quality of the ticking varies with the type of filling used. There is a carding machine in the next room, which is used for breaking up the lumps of the filling, and for cleaning it.

The girls are paid on a piece-rate fixed by the workshop.

ii. Chair caning section. Seats of chairs are remade here by the girls. These girls are easily transferable to the upholstery section, since they are trained for both types of work.

The work here also is paid on a piece rate fixed by the workshop.

5. Boot and Shoe Department.

Boots and shoes are both made and repaired here. There are eleven journeymen, but owing to a general depression in this trade, about half of them are unemployed.

If the soles are to be stitched, the shoes are sent out on sub-contract. Only rivetting is performed here. The soles are cut and shaped by a sighted person.

Leather, when purchased for soling, always has one side prepared and varnished, while the flesh side remains unfinished. This department places the prepared side nearest the foot, and the flesh side on the outside. They have found by this method that more wear is obtained from the sole. The uppers are purchased and added to the soles.

The workers are paid on a piece-rate fixed by the Trade Board.

There are fifteen pupils who are in a room adjacent to the workroom, where a period of training of three years is considered the maximum.

There is a Foreman and an Assistant Foreman in charge of the department, and a young sighted boy is employed as a messenger.

6. Brush Department.

Both pan and drawn work are performed in this department.

There are two sighted borers who bore the stocks of brushes for both pan and drawn work. Most of the stocks for standard types of brushes for drawn work, however, are purchased already bored. This boring is paid on a piece rate fixed by the Board of Trade. The stocks are taken to the blacking and stamping bench. Here they are blacked and 'pickered', i.e. all chips of wood are taken out of the holes. The stocks are then issued to the pan and drawn hands.

There is a sighted hair-dresser for the whole department. He is paid on a piece rate fixed by the Trade Board. The hair is then issued to the operators.

After the brushes are made by the blind operatives, an inspection is made by a partially-sighted worker. The brushes are then trimmed. There are two trimmers. One is a fully sighted man who trims with a pair of bench shears. All hair-work brushes from the pan section are trimmed by him. He is paid on a piece rate fixed by the Trade Board. Bass work, however, from the pan workers, and all drawn work is trimmed by a partially-sighted worker on a machine. He is paid on a time-wage.

The brushes are then 'back-nailed on' by a partially-sighted worker who also finishes the edges. The process is completed by sand-papering the brushes on a machine operated by a sighted or a partially-sighted worker.

i. Pan work. There are eleven '4-strike' pans in this department at which only men are employed. These workers whiten the backs of the stocks and mark their brushes to indicate responsibility for work done. Four workers sit at each table, which is square in shape, each side being forty-eight inches long.

The pans are approximately sixteen inches in diameter. Each pan is heated by a bunsen burner placed 2½ inches below it.

The vapours are removed entirely by overhead ducts, ten inches in diameter, without the aid of an exhaust fan. The duct above one table is connected in the centre of the room to a duct from another table, and a chimney leading out of the roof is formed. There are five chimneys, each with a diameter of twelve and a half inches. The mouths of the ducts are placed ten inches above the pan, the diameter at this stage being twenty-one and a half inches. Despite the fact there are eleven pans in this room, the atmosphere is singularly clear of all vapour. We understand that an exhaust fan was previously used, and that this was responsible for increasing the viscosity of the pitch. When, by experiment, it was discovered that the exhaust fan was not necessary, it was also discovered that the pitch then remained at a fairly constant viscosity, and that the main substance in the pitch which acted as a bonding material remained. This produced a marked improvement in the finished brushes. The management are therefore of opinion that the extraction fan tends to draw ~~to~~ some of the substance out of the pitch, and that this substance is beneficial for the binding of the hair, bass etc.

All pan hands are paid on a piece rate fixed by the Trade Board.

ii. Drawn work. Here seven women are employed and they manufacture the usual type of articles - nail and strubbing brushes etc.

All the workers are paid on piece rates fixed by the Trade Board.

There is a sighted Foreman and an Assistant in charge of both sections - pan and drawn work - and these are responsible for the supervision of the whole department.

7. Mat Department.

Here the usual type of articles manufactured are medium double, double and extra double mats, wool and wool-bordered mats, sinnet and kneeling mats, and matting.

The raw material is first wound into balls. The operation is here performed both by machinery and by hand. The latter process is adopted in order to offer employment. The length of coir varies from hank to hank but the variations are slight. By the hand process, the hank is first unravelled into a box or basket, and then made into a ball. This latter part of the process of balling required eight minutes.

The machine used for balling is a one-horse-power motor connected by belt to a roller. A spindle on which the hank is wound is clamped on to the roller. The hank is placed on a runner, with one end tied to the spindle. The operator then starts the machine. By this process, hanks were wound in an average time of two minutes five seconds.

The warp is then made from these balls. The management here insist that the strongest and best coir - Ceylon Coir - should always be utilised to make the warp. Pegs are placed in the wall, and a man walks up and down from one row of pegs to the other making the warp. Double thread is always used. No particular individual in the department is allocated to this work, but any partially-sighted man may be called upon to do it.

The material is taken off these pegs and beamed by hand. Five men are required to beam. A thirty-eight-inch mat of one hundred threads, seventy-five yards long, was beamed by these men in eighteen minutes. The beam containing the material is then placed on a loom.

There are nineteen looms. Some of them have battrams of wood, and some, as usual, of cast iron. The management found that mats made by looms whose battrams were made of wood produced a mat similar in appearance to that made by the cast iron battram loom. A noticeable feature, however, was that less material had been used by the former type of loom, and the mats were consequently lighter in weight. Since mats are sold by linear measurement and not by weight, considerable savings have resulted by this method. The rods were of varying thicknesses and widths.

The weavers are paid on a piece-rate fixed by the Coir Mat and Matting Association.

After the mats have been made on the looms, they are squared by a partially-sighted worker paid on a time-wage. The next process - binding - is performed by a totally blind man paid on a piece rate. The mats are then sheared on a machine and passed to a partially-sighted worker paid on a time wage to complete the process by hand-trimming. The dust and the coir sheared off the mat by the machine is effectively removed by the aid of ducts and an extraction fan.

Kneeling and sinnet mats are made here, though the plaits are purchased ready made. Matting, too, of various colours is made. This is the only Institution we have seen where coloured matting is prepared. The matting is usually purchased by Institutions, and is then cut to various lengths and bordered. Here, the coir is dyed and the matting made on the looms in the usual manner. The coir is dyed in a bath of boiling water to which small quantities of acetic acid, glauber salts, and the dye have been added

8. Basket Department.

This trade is conducted in a very large room; consequently there are four rows of basket makers, with two aisles seven feet wide. The pitch allocated each worker is approximately nine feet long by eight feet six inches wide, and this accommodation is ample for his requirements. The pitch is marked out by a wood border nine inches high, which prevents one worker from trespassing on to the floor space of his neighbour.

There are sixty workers and pupils in this department. Of these, approximately twelve are pupils. The usual type of articles made here are potatoe hampers, skips, general square work, cane chairs and rush seating.

There is a partially-sighted man as the Foreman. He has partially-sighted worker in charge of the cellars where the raw material is kept. This worker, with three others, one of whom is totally blind, sort the cane etc., and place the material in the tanks to soften on receipt of instructions from the Foreman. A partially sighted worker who is employed as a general handyman conveys the material to each worker at his pitch.

Some of the workers used gauges in order to construct their baskets. In the majority of cases where these gauges were used, the boards were on rollers, and this facilitated the handling of the basket when nearing completion. Each worker cuts his own stakes. The finishing is performed by the Foreman and the partially-sighted worker who is in charge of the cellars.

All workers are paid on a piece-rate fixed by the Lancashire and Cheshire Skip and Basket Makers'Association.

There is an Assistant Foreman, who is sighted, and he is in sole charge of the pupils. Three years is the minimum period for training in this trade.

There are two large and two small tanks for soaking cane, and one large tank for boiling brown willow. This is considered ample for the requirements of the department, particularly since the journeymen rarely place their incompleted baskets in the tanks.

III. FURNITURE DEPARTMENT.

This trade is not conducted in the Hayesleigh Workshops but in the main Institution. It was started about a year ago. Since then, great progress has been made. No totally blind individuals are employed in this department. As at Glasgow, the department is sub-divided into

i. the Machine Shop,
ii. the Assembling Section,
iii. the French Polishing Section.

i. The Machine Shop. A number of machines are in this section, but few were in operation at the period of our visit. This was due mainly to the fact that a number of pupils were still on holiday. There were the following machines.

Two Planing Machines: both have guards and are operated by the partially-sighted pupils.

Two Saws. One of these is of the swinging type. Both machines have guards.

One Dovetailing Machine.

One Dimension Saw Bench. The saw, circular in shape, is moved up or down as required, while the table on which the material is placed can be tilted to any required angle.

One Sand Papering Machine. The sand-paper is placed on an endless belt which is run by a motor. A table is placed underneath the belt, and a lever places a flat press on to the belt and, in turn, against the wood requiring to be sand-papered.

One Boring Machine for making jigs.

One Fret-Saw Machine.

One Spindle Moulding Machine.

One Grinding Machine for tools.

The partially-sighted pupils manipulate all these machines except the last two, which are used only by the sighted hands in the section. The fret saw machine, however, is rarely used by the partially-sighted pupils since it tends to cause excessive eye-strain.

There are only two partially-sighted pupils. The minimum training period in this section is two years.

ii. Assembling section. The parts prepared in the machine shop are assembled before the furniture is ready for French polishing. Step ladders, cupboards, chests-of-drawers, bedsteads, mantelpieces, etc., are assembled. A large room is required for this process. At present, this section is in the same room as the machine shop. The dimensions of this room are approximately forty-five feet by thirty-five feet. The management, however, feel the need for more accommodation owing to the rapid growth of the department.

The minimum period for training in this section is two year

iii. French polishing section. Owing to lack of accommodation, this section is in a building in the same grounds as the Hayesleigh Workshops, at a distance of over six hundred yards from the previous process. The polishing is performed by hand by partially-sighted girls under sighted supervision.

Three years is the minimum period of training.

A definite amount of eyesight is considered absolutely essential in order to conduct this trade.

We wish to express our appreciation of the permission given by Mr. A. R. Bannister, the Director, to our investigator to make this survey. Mr. Bannister was on holiday, but in his absence, Mr. J. B. Roberts, the Works Manager, gave every assistance in producing the data for this report. Throughout the survey, Mr. Roberts took especial care to point out any particular features peculiar to these workshops, and he emphasised the considerable savings possible in the purchasing of raw materials For his valuable assistance, we wish to convey to Mr. Roberts our special thanks.

September, 1930.

(signed) Harry Ward

For Director

R295

APPENDIX I.

Average Wages earned by workers in the various trades.

Departments.	Average wages earned per week per worker by:			
	Partially Blind		Totally Blind	
Weaving	Figures not obtained owing to workers not being continuously employed.			
Brush				
i. Pan Work.	"		"	
ii. Drawn Work.	"		"	
Mat	"		"	
Knitting				
i. Flat Machines	12/10	(2)	13/9	(2)
ii. Round "	10/7	(10)	17/3	(1)
Basketry	13/2	(4)	-	
Upholstery and Chair Caning	11/9	(3)	12/4	(3)
Boot and Shoe	26/-	(3)	25/10	(3)
Basket	23/7	(14)	19/7	(21)

The figures in brackets indicate the number of workers from whose wages these averages have been calculated.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

ALDWYCH HOUSE, ALDWYCH, W.C.2.
R301

Report of ~~Investigation~~ VISIT

AT

THE INCORPORATED INSTITUTE FOR THE BLIND,
ROUNDHAY ROAD,
LEEDS.

Investigator : C. B. Fox.
Period : September 22nd to October 4th, 1930.

I. INTRODUCTION. (pp.1, 2.)

II. TRADES CONDUCTED BY WOMEN. (pp.2 - 5.)

  1. Knitting Department. (pp.2 - 4.)

    i. Flat machines. (p.2.)
    ii. Round machines. (pp.2 - 4.)

  2. Chair Caning Department. (p.4.)

  3. Brush Department. Drawn Work. (pp.4, 5.)

III. TRADES CONDUCTED BY MEN. (pp.5 - 19.)

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APPENDIX I: AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

APPENDIX II: PIECE-RATE FOR CHAIR CANING DEPARTMENT.

APPENDIX III: ELEVATION OF APPARATUS FOR BEAMING.

I. INTRODUCTION.

The buildings for the workshops and training schools etc. of the Incorporated Institute for the Blind at Roundhay Road, Leeds, are all situated near each other. The training school is in a building apart from the workshops, and at this school all trainees receive full instructions in their specific trades.

Where possible, workers are paid on a piece rate. Appendix I shows the average wages earned in each trade. Figures have been recorded for the year 1929, only full working weeks having been taken into consideration. Both men and women worked for forty-eight hours a week until early this year, since when they have worked forty-four hours a week. The six-day week is still retained. It is interesting that this reduction in hours has not materially affected the wages earned. Augmentation of twenty shillings per week is paid to all workers - a method of payment simple and direct, and requiring no mental calculation on the part of the workers.

The workshops for those trades employing women labour are entirely separated from those in which men are employed.

For the comfort of the workers in those workrooms in which the workers have their feet on the ground while working, such as in the Brush, Basket, Knitting and Chair Caning Departments, floors of wood, instead of stone, have been laid down. There is a canteen for both men and women workers, a room being apportioned for each. A luncheon of two courses is served for sixpence. Throughout the factory, the walls have been washed a light colour in order to take maximum advantage of daylight. Every effort is made by the management to inaugurate social functions etc. to provide happiness and comfort for the blind in their leisure hours A noticeable feature is the maintenance of an excellent library to which every blind person has access.

The Institute possesses two retail shops. One shop is on the premises at Roundhay, and the other at the end of Albion Street. Neither of them are in the shopping centre of the town. It may prove advantageous from a financial point of view for Institutions in general to have retail shops in the centre of the towns. Admittedly the rent of a shop in such a situation is high, but we are of opinion that the business transacted under such conditions far outweigh this disadvantage.

II. TRADES CONDUCTED BY WOMEN.

1. Knitting Department.

Work is conducted in this department on both flat and round machines, and one girl is continuously employed on hand-knitting. The Institute has a good market for the hand-knitted garments: occasionally they are compelled to place more girls on this work in order to meet the demand. The worker usually employed on this work is totally blind and is paid on a piece rate fixed by the Institution.

i. Flat machines. There are five flat machines of which one is a Jacquard, two are 10-gauge and two are 7-gauge machines. They are all fairly well equipped with modern devices.

The material is not shaped on the machines. We understand that very little waste occurs in the process of cutting, as the department makes allowances for the shrinkage of material when it is taken off the machines.

The picking-in on the machines is performed by the Assistant Forewoman - a sighted person.

ii. Round machines. There are twelve round machines in this department where the usual articles made are socks and stockings.

The Assistant Forewoman and a young sighted girl are employed in working the overlocking machine, in ironing, and in issuing material to the operators. The heating of the iron is performed electrically. On our recommendation, a red bulb has been installed and is lit whenever the current is switched on. This indicator tends to prevent the operator from wasting current, and to reduce the possibilities of a fire. The Manager of a blind institution has specifically stated that the introduction of such an indicator considerably reduced the amount of current used for ironing.

Bobbin Winding. There are three pairs of wooden swifts and one pair of metal swifts in the department. It is found here that wooden swifts do not change shape through damage as easily as the metalled ones and that consequently, they are much more durable.

All operators wind their own materials on bobbins. The wool is not waxed. In order to add mechanical strength to the finer wools such as 2/28 and 2/32, we strongly recommend that they be waxed during the process of bobbin-winding.

During the period of our visit there were at least two girls always winding bobbins. If a bobbin winding machine for six bobbins were installed and mechanically driven, about fifty-five to sixty pounds of wool per day could be wound, and only one person would be required to feed the machine. This is a much greater quantity than can be wound by two girls hand-winding throughout the day. One girl winds approximately one pound in thirty minutes, or sixteen pounds in an eight-hour day; so that the machine would produce nearly three and a half times as much as a hand-winder. It would therefore save the work of two and a half workers, (one person is necessary to feed the machine). In addition, by using a mechanically driven machine, all the flat and round machine operators would be employed continuously at their machines, and output would thereby be increased. Should the department feel the need for increasing output, we strongly recommend the purchase of such a machine.

All workers are paid on piece-rates fixed by the Institution.

Workers are trained at the school, where the minimum period is three years. Many of the operators can manipulate both types of machines, and can also cane chairs. Thus workers can be transferred from one type of work to another in order to comply with rush orders. The operators, however, have a decided preference for the work on which the greater wages can be earned. To prevent any friction between the workers and to ensure that workers occasionally obtain the type of work they desire, frequent changes are made from machine to machine. This undoubtedly lowers the wage-earning capacities of the workers, though it is the most economical method at present of carrying out the policy of the Institution.

There is a partially sighted girl in charge of this department and of the Chair Caning Department.

2. Chair Caning Department.

Here five girls are employed, and are paid on a piece-rate (see Appendix II) fixed by the Institute.

This department is in the next room to the Knitting Department, and is easily supervised by the Forewoman in charge of these departments.

3. Brush Department. Drawn Work.

Ten girls are employed on this work, where the usual type of drawn work brushes are prepared. In addition, excellent hair brushes, billiard table brushes, porcupine stove and wire drawn brushes are also manufactured here.

The senior girl, who is partially sighted, is in charge of this department. She supplies the workers with raw material and is responsible for the discipline of the room. Inspection of the work is performed in the main department under the Foreman.

The girls are paid on a piece-rate fixed by the Brush and Broom Board of Trade.

III. TRADES CONDUCTED BY MEN.

1. Brush Department.

Here both pan and drawn work are performed. The pan work is done only by men, while all drawn work is performed by the girls. The Drawn Work Department has already been discussed.

The boring for all brushes is done in the department. A man and a boy (both sighted) are employed for boring the stocks for pan work, while a man and two boys (all sighted) bore for drawn work. There are also a hair dresser and three bass dressers. This is the only Institute we have visited where bass dressing is performed. The material is purchased in the raw state, cut into definite lengths and then issued to the dressers, who dress the bass: each dresser is allotted a cubicle for this purpose. The material is then ready for issue to the workers. We understand that it is much cheaper to obtain the bass in this way than to purchase it already treated.

i. Pan work. **All material is issued to workers at their seats. Rotary and scavenger brushes are among the many types** manufactured in this department.

There are eight 4-strike pans in this department. All the tables are square with fifty-inch sides, while the pans are eighteen inches in diameter. The vapours are extracted very effectively through ducts leading below ground level by an extraction fan. The pitch appeared to be in a more fluid state than that in other blind institutions. The pitch is heated by town gas. The flames emanate from holes in a ring placed about three inches below the pan, and rise vertically up to the pan, while there is a surrounding plate to protect the flames from draughts. This protection increases the amount of heat available for the pitch.

There is a sighted journeyman on pan work, who, in addition, bores the stocks and inspects the hair pan work. In order to compete with local firms, it has been found necessary to instal a sighted man as an inspector for bass work. He feeds the workers with raw material, and acts as a trimmer for the whole of the Brush Department.

Many of the backs of brushes are shaped in this department. Shaping is performed on one machine by two sighted hand-trimmers.

A deaf, dumb and partially sighted man, who has had experience from the sighted trade, is employed to polish the backs of hair brushes, nail and billiard table brushes etc. When the process is complete the finished brushes have a very attractive appearance and cannot be distinguished from brushes made by sighted labour.

Another feature of this department is the re-conditioning of old and worn out rotary brushes. These are subjected to a process of steam-heating in order to soften the pitch. The bass is then removed by hand from the circular stock, which is cleaned and is then ready for refilling by bass to make a completely new rotary brush.

All the workers are paid on a piece-rate fixed by the Brush and Broom Board of Trade. The training is conducted at the school where a period of three years is considered adequate.

Both sections, men and women, are under the same sighted Foreman.

2. Mat Department.

The usual types of medium and common medium mats, wool-bordered and sinnet mats are made. In addition, some attractively designed coloured mats are prepared.

The coir is first wound into balls by hand by four totally blind and partially sighted men. The management are aware that the process can be performed at a much quicker rate by the assistance of balling machines, but the hand process is retained to give these four men employment. Some of the balls are given to a partially sighted man who prepares warps on a warping mill. When the material is ready on the mill, it is removed to the next room where it is beamed, and it is then ready to be placed on the loom.

The material is placed round some bars - there are five bars for the purpose - about six feet six inches high, so as to increase the tension of the material when it is wrapped round the beam. It is then carried about fifteen feet over a bar at the same height, under a bar three feet six inches high, and back through a reed towards the beam, in the manner shown in Appendix III. Just before the reed, however, is a circular frame of six arms, on each of which is a brush containing bristles of about one and a half inches in length. The material is wrapped round the beam by the aid of a motor. The circular frame is connected to the motor by a belt, so that it revolves in the opposite direction to the beam. The whole operation of beaming requires the aid of only two men. This appears to be the easiest method of beaming in workshops employing blind labour.

There are fifteen looms. Each worker has rods of varying widths to be used on different types of mats. The mats are taken off the looms and are first squared and then tied. Both these operations are performed either by a sighted assistant or by a partially sighted man. Plaits are bound round the edge of the mat by a Singer machine which is driven by a motor and operated by a sighted assistant. About three inches of the plait is left on the mat to be sewn by hand. The mat is then sheared on a machine and finally clipped by hand. There are two machines for shearing. The fluff and coir etc. is removed very effectively from both machines by ducts leading below the ground.

Plaits are purchased ready made. Sinnet mats are made in the department, without the aid of the numerous pins which act as guides in other blind institutions.

Mats of varying designs are made in this department in a novel and yet direct manner. The mat is first made on the loom as an ordinary coir mat with no design. After the mat has been completely finished, it is sent down to the dyeing process. Here, dye is placed in boiling water and the whole is thoroughly mixed. There are four receptacles in order that four colours can be prepared at the same time. Stencils of various designs are placed on the mats, the dye is extracted from the receptacles by the aid of a gun which emits the solution in an atomised form, and with such force that it penetrates deeply into the exposed portions of the mats. The whole process of dyeing a mat does not take longer than eight minutes, and this is the only additional time needed to prepare such a mat.

As many of the workers as possible are paid on piece-rates fixed by the Coir Mat and Matting Association.

There is a very able sighted Foreman in charge of the whole department.

The training of the workers is conducted in the school where a period of three years is considered the minimum.

3. Basket Department.

This department comprises three workrooms. As in all other workshops employing blind labour for making baskets, the workers sit in two rows down the length of the room, with their backs to the wall. There are windows in both the long sides of the room, so that full advantage is taken of the daylight.

Many kinds of baskets are prepared, from skips to basket carriers and office trays.

The pitch allotted to each basket maker is approximately eleven feet by nine feet and allows ample accommodation. Each pitch is marked out by partitions eight inches high, and these partitions prevent one worker from trespassing on the floor space of his neighbour. The workers use frames for both square and round work.

A noticeable feature in this department is that the bottom of a basket which is in the process of preparation is fixed to a plank of wood by a peg: the journeyman can therefore manipulate his basket easily by swivelling it round this peg on the plank.

There is a sighted Foreman in charge of the department, as well as a sighted assistant who supplies the workers with materials, cuts their stakes, and is responsible for general supervision. There are three sighted finishers who attend to the 'picking' of the baskets and who put on rollers, bolts etc. Two totally blind men are employed as sorters of cane and willow, and they perform this operation extremely satisfactorily.

The tanks for soaking the materials are in the basement immediately below the Basket Department.

Training is conducted at the school where the minimum period is three years. The journeymen are paid on piece-rates fixed by the Yorkshire Employees Cane and Willow Workers Association.

We wish to express our appreciation of the assistance given to our investigator by the entire staff of the Institute, and especially thank Mr. W. P. Swann, the Superintendent and Secretary of the Institute. Every facility was given to obtain all the data necessary to produce results which we are sure will be beneficial in time to the blind in general.

1st November, 1930. (Signed) G. H. Miles

For Director.

APPENDIX I.

AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

The numbers in brackets denote the number of workers from whose wages the average wage is calculated.

	Average Wages earned per week per worker.	
Departments.	Partially Blind	Totally Blind.
Knitting	10/8 (8)	7/7 (5)
Chair Caning	12/- (2)	19/- (1)
Brush (Female)	19/10½(5)	14/7 (8)
" (Male)	31/8 (7)	25/9 (12)
Mat (Weavers)	31/1 (3)	27/9 (6)
Basket	25/0½ (3)	18/11(17)

APPENDIX II.

PIECE-RATE FOR CHAIR CANING DEPARTMENT.

Rocking Chairs.

100 holes	3/- per back or seat of chair.
112 "	3/3 " " " " " "
128 "	3/6 " " " " " "

Ordinary Bed-room Chairs.

Less than 18 rows	1/3 per back or seat of chair.
18 -21 "	1/6 " " " " " "
22 -24 "	1/9 " " " " " "
25 -28 "	2/3 and 2/6 " " " " "

For 'bent rows' the higher figure of bed-room chairs in each case is always paid.

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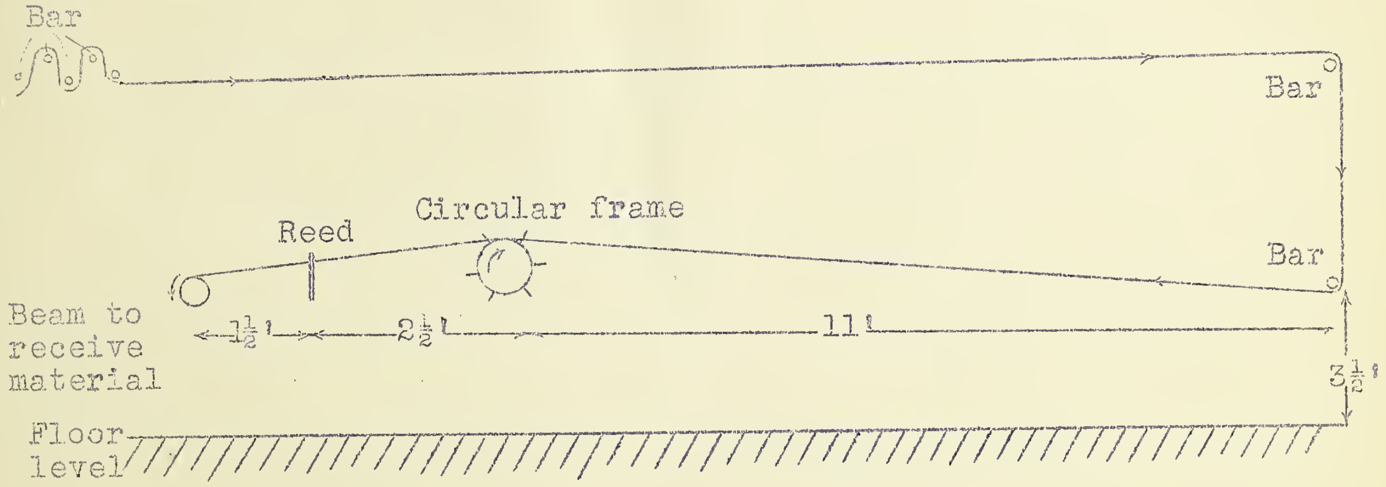
APPENDIX III

ELEVATION OF APPARATUS FOR BEAMING



E.J.R.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.
R301

Report of ~~Investigation~~ VISIT

AT

THE INCORPORATED INSTITUTE FOR THE BLIND,
ROUNDHAY ROAD,
LEEDS.

Investigator : C. B. Fox.
Period : September 22nd to October 4th, 1930.

I. INTRODUCTION. (pp.1, 2.)

II. TRADES CONDUCTED BY WOMEN. (pp.2 - 5.)

  1. Knitting Department. (pp.2 - 4.)

    i. Flat machines. (p.2.)
    ii. Round machines. (pp.2 - 4.)

  2. Chair Caning Department. (p.4.)

  3. Brush Department. Drawn Work. (pp.4, 5.)

III. TRADES CONDUCTED BY MEN. (pp.5 - 10.)

  1. Brush Department. (pp.5, 6.)

  2. Mat Department. (pp.6 - 8.)

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Where possible, workers are paid on a piece rate. Appendix I shows the average wages earned in each trade. Figures have been recorded for the year 1929, only full working weeks having been taken into consideration. Both men and women worked for forty-eight hours a week until early this year, since when they have worked forty-four hours a week. The six-day week is still retained. It is interesting that this reduction in hours has not materially affected the wages earned. Augmentation of twenty shillings per week is paid to all workers - a method of payment simple and direct, and requiring no mental calculation on the part of the workers.

The workshops for those trades employing women labour are entirely separated from those in which men are employed.

For the comfort of the workers in those workrooms in which the workers have their feet on the ground while working, such as in the Brush, Basket, Knitting and Chair Caning Departments, floors of wood, instead of stone, have been laid down. There is a canteen for both men and women workers, a room being apportioned for each. A luncheon of two courses is served for sixpence. Throughout the factory, the walls have been washed a light colour in order to take maximum advantage of daylight. Every effort is made by the management to inaugurate social functions etc. to provide happiness and comfort for the blind in their leisure hours A noticeable feature is the maintenance of an excellent library to which every blind person has access.

The Institute possesses two retail shops. One shop is on the premises at Roundhay, and the other at the end of Albion Street. Neither of them are in the shopping centre of the town. It may prove advantageous from a financial point of view for Institutions in general to have retail shops in the centre of the towns. Admittedly the rent of a shop in such a situation is high, but we are of opinion that the business transacted under such conditions far outweigh this disadvantage.

II. TRADES CONDUCTED BY WOMEN.

1. Knitting Department.

Work is conducted in this department on both flat and round machines, and one girl is continuously employed on hand-knitting. The Institute has a good market for the hand-knitted garments: occasionally they are compelled to place more girls on this work in order to meet the demand. The worker usually employed on this work is totally blind and is paid on a piece rate fixed by the Institution.

i. Flat machines. There are five flat machines of which one is a Jacquard, two are 10-gauge and two are 7-gauge machines. They are all fairly well equipped with modern devices.

The material is not shaped on the machines. We understand that very little waste occurs in the process of cutting, as the department makes allowances for the shrinkage of material when it is taken off the machines.

The picking-in on the machines is performed by the Assistant Forewoman - a sighted person.

ii. Round machines. There are twelve round machines in this department where the usual articles made are socks and stockings.

The Assistant Forewoman and a young sighted girl are employed in working the overlocking machine, in ironing, and in issuing material to the operators. The heating of the iron is performed electrically. On our recommendation, a red bulb has been installed and is lit whenever the current is switched on. This indicator tends to prevent the operator from wasting current, and to reduce the possibilities of a fire. The Manager of a blind institution has specifically stated that the introduction of such an indicator considerably reduced the amount of current used for ironing.

Bobbin Winding. There are three pairs of wooden swifts and one pair of metal swifts in the department. It is found here that wooden swifts do not change shape through damage as easily as the metalled ones and that consequently, they are much more durable.

All operators wind their own materials on bobbins. The wool is not waxed. In order to add mechanical strength to the finer wools such as 2/28 and 2/32, we strongly recommend that they be waxed during the process of bobbin-winding.

During the period of our visit there were at least two girls always winding bobbins. If a bobbin winding machine for six bobbins were installed and mechanically driven, about fifty-five to sixty pounds of wool per day could be wound, and only one person would be required to feed the machine. This is a much greater quantity than can be wound by two girls hand-winding throughout the day. One girl winds approximately one pound in thirty minutes, or sixteen pounds in an eight-hour day; so that the machine would produce nearly three and a half times as much as a hand-winder. It would therefore save the work of two and a half workers, (one person is necessary to feed the machine). In addition, by using a mechanically driven machine, all the flat and round machine operators would be employed continuously at their machines, and output would thereby be increased. Should the department feel the need for increasing output, we strongly recommend the purchase of such a machine.

All workers are paid on piece-rates fixed by the Institution.

Workers are trained at the school, where the minimum period is three years. Many of the operators can manipulate both types of machines, and can also cane chairs. Thus workers can be transferred from one type of work to another in order to comply with rush orders. The operators, however, have a decided preference for the work on which the greater wages can be earned. To prevent any friction between the workers and to ensure that workers occasionally obtain the type of work they desire, frequent changes are made from machine to machine. This undoubtedly lowers the wage-earning capacities of the workers, though it is the most economical method at present of carrying out the policy of the Institution.

There is a partially sighted girl in charge of this department and of the Chair Caning Department.

2. Chair Caning Department.

Here five girls are employed, and are paid on a piece-rate (see Appendix II) fixed by the Institute.

This department is in the next room to the Knitting Department, and is easily supervised by the Forewoman in charge of these departments.

3. Brush Department. Drawn Work.

Ten girls are employed on this work, where the usual type of drawn work brushes are prepared. In addition, excellent hair brushes, billiard table brushes, porcupine stove and wire drawn brushes are also manufactured here.

The senior girl, who is partially sighted, is in charge of this department. She supplies the workers with raw material and is responsible for the discipline of the room. Inspection of the work is performed in the main department under the Foreman.

The girls are paid on a piece-rate fixed by the Brush and Broom Board of Trade.

III. TRADES CONDUCTED BY MEN.

1. Brush Department.

Here both pan and drawn work are performed. The pan work is done only by men, while all drawn work is performed by the girls. The Drawn Work Department has already been discussed.

The boring for all brushes is done in the department. A man and a boy (both sighted) are employed for boring the stocks for pan work, while a man and two boys (all sighted) bore for drawn work. There are also a hair dresser and three bass dressers. This is the only Institute we have visited where bass dressing is performed. The material is purchased in the raw state, cut into definite lengths and then issued to the dressers, who dress the bass: each dresser is allotted a cubicle for this purpose. The material is then ready for issue to the workers. We understand that it is much cheaper to obtain the bass in this way than to purchase it already treated.

i. Pan work. All material is issued to workers at their seats. Rotary and scavenger brushes are among the many types manufactured in this department.

There are eight 4-strike pans in this department. All the tables are square with fifty-inch sides, while the pans are eighteen inches in diameter. The vapours are extracted very effectively through ducts leading below ground level by an extraction fan. The pitch appeared to be in a more fluid state than that in other blind institutions. The pitch is heated by town gas. The flames emanate from holes in a ring placed about three inches below the pan, and rise vertically up to the pan, while there is a surrounding plate to protect the flames from draughts. This protection increases the amount of heat available for the pitch.

There is a sighted journeyman on pan work, who, in addition, bores the stocks and inspects the hair pan work. In order to compete with local firms, it has been found necessary to instal a sighted man as an inspector for bass work. He feeds the workers with raw material, and acts as a trimmer for the whole of the Brush Department.

Many of the backs of brushes are shaped in this department. Shaping is performed on one machine by two sighted hand-trimmers.

A deaf, dumb and partially sighted man, who has had experience from the sighted trade, is employed to polish the backs of hair brushes, nail and billiard table brushes etc. When the process is complete the finished brushes have a very attractive appearance and cannot be distinguished from brushes made by sighted labour.

Another feature of this department is the re-conditioning of old and worn out rotary brushes. These are subjected to a process of steam-heating in order to soften the pitch. The bass is then removed by hand from the circular stock, which is cleaned and is then ready for refilling by bass to make a completely new rotary brush.

All the workers are paid on a piece-rate fixed by the Brush and Broom Board of Trade. The training is conducted at the school where a period of three years is considered adequate.

Both sections, men and women, are under the same sighted Foreman.

2. Mat Department.

The usual types of medium and common medium mats, wool-bordered and sinnet mats are made. In addition, some attractively designed coloured mats are prepared.

The coir is first wound into balls by hand by four totally blind and partially sighted men. The management are aware that the process can be performed at a much quicker rate by the assistance of balling machines, but the hand process is retained to give these four men employment. Some of the balls are given to a partially sighted man who prepares warps on a warping mill. When the material is ready on the mill, it is removed to the next room where it is beamed, and it is then ready to be placed on the loom.

The material is placed round some bars - there are five bars for the purpose - about six feet six inches high, so as to increase the tension of the material when it is wrapped round the beam. It is then carried about fifteen feet over a bar at the same height, under a bar three feet six inches high, and back through a reed towards the beam, in the manner shown in Appendix III. Just before the reed, however, is a circular frame of six arms, on each of which is a brush containing bristles of about one and a half inches in length. The material is wrapped round the beam by the aid of a motor. The circular frame is connected to the motor by a belt, so that it revolves in the opposite direction to the beam. The whole operation of beaming requires the aid of only two men. This appears to be the easiest method of beaming in workshops employing blind labour.

There are fifteen looms. Each worker has rods of varying widths to be used on different types of mats. The mats are taken off the looms and are first squared and then tied. Both these operations are performed either by a sighted assistant or by a partially sighted man. Plaits are bound round the edge of the mat by a Singer machine which is driven by a motor and operated by a sighted assistant. About three inches of the plait is left on the mat to be sewn by hand. The mat is then sheared on a machine and finally clipped by hand. There are two machines for shearing. The fluff and coir etc. is removed very effectively from both machines by ducts leading below the ground.

Plaits are purchased ready made. Sinnet mats are made in the department, without the aid of the numerous pins which act as guides in other blind institutions.

Mats of varying designs are made in this department in a novel and yet direct manner. The mat is first made on the loom as an ordinary coir mat with no design. After the mat has been completely finished, it is sent down to the dyeing process. Here, dye is placed in boiling water and the whole is thoroughly mixed. There are four receptacles in order that four colours can be prepared at the same time. Stencils of various designs are placed on the mats, the dye is extracted from the receptacles by the aid of a gun which emits the solution in an atomised form, and with such force that it penetrates deeply into the exposed portions of the mats. The whole process of dyeing a mat does not take longer than eight minutes, and this is the only additional time needed to prepare such a mat.

As many of the workers as possible are paid on piece-rates fixed by the Coir Mat and Matting Association.

There is a very able sighted Foreman in charge of the whole department.

The training of the workers is conducted in the school where a period of three years is considered the minimum.

3. Basket Department.

This department comprises three workrooms. As in all other workshops employing blind labour for making baskets, the workers sit in two rows down the length of the room, with their backs to the wall. There are windows in both the long sides of the room, so that full advantage is taken of the daylight.

Many kinds of baskets are prepared, from skips to basket carriers and office trays.

The pitch allotted to each basket maker is approximately eleven feet by nine feet and allows ample accommodation. Each pitch is marked out by partitions eight inches high, and these partitions prevent one worker from trespassing on the floor space of his neighbour. The workers use frames for both square and round work.

A noticeable feature in this department is that the bottom of a basket which is in the process of preparation is fixed to a plank of wood by a peg: the journeyman can therefore manipulate his basket easily by swivelling it round this peg on the plank.

There is a sighted Foreman in charge of the department, as well as a sighted assistant who supplies the workers with materials, cuts their stakes, and is responsible for general supervision. There are three sighted finishers who attend to the 'picking' of the baskets and who put on rollers, bolts etc. Two totally blind men are employed as sorters of cane and willow, and they perform this operation extremely satisfactorily.

The tanks for soaking the materials are in the basement immediately below the Basket Department.

Training is conducted at the school where the minimum period is three years. The journeymen are paid on piece-rates fixed by the Yorkshire Employees Cane and Willow Workers Association.

We wish to express our appreciation of the assistance given to our investigator by the entire staff of the Institute, and especially thank Mr. W. P. Swann, the Superintendent and Secretary of the Institute. Every facility was given to obtain all the data necessary to produce results which we are sure will be beneficial in time to the blind in general.

1st November, 1930. (Signed) G. H. Miles
For Director.

APPENDIX I.

AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

The numbers in brackets denote the number of workers from whose wages the average wage is calculated.

	Average Wages earned per week per worker.	
Departments.	Partially Blind	Totally Blind.
Knitting	10/8 (8)	7/7 (5)
Chair Caning	12/- (2)	19/- (1)
Brush (Female)	19/10½(5)	14/7 (8)
" (Male)	31/8 (7)	25/9 (12)
Mat (Weavers)	31/1 (3)	27/9 (6)
Basket	25/0½ (3)	18/11(17).

APPENDIX II.

PIECE-RATE FOR CHAIR CANING DEPARTMENT.

Rocking Chairs.

100 holes	3/- per back or seat of chair.
112 "	3/3 " " " " " "
128 "	3/6 " " " " " "

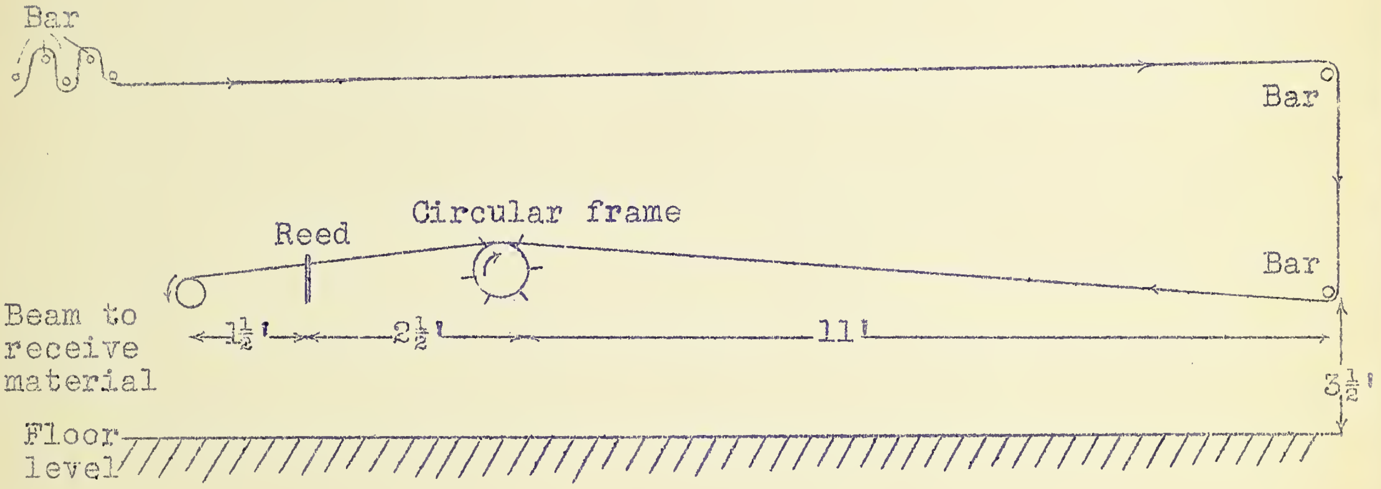
Ordinary Bed-room Chairs.

Less than 18 rows	1/3 per back or seat of chair.
18 -21 "	1/6 " " " " " "
22 -24 "	1/9 " " " " " "
25 -28 "	2/3 and 2/6 " " " " "

For 'bent rows' the higher figure of bed-room chairs in each case is always paid.

APPENDIX III

ELEVATION OF APPARATUS FOR BEAMING



E.J.R.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

ALDWYCH HOUSE, ALDWYCH, W.C.2.

R302

Report of ~~Investigation~~ VISIT

AT

THE WORKSHOPS OF THE SHEFFIELD CORPORATION,
WELFARE OF THE BLIND DEPARTMENT,
SHEFFIELD.

Period: October 6th - 18th 1930.
Investigator: C. B. Fox.

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II. TRADES CONDUCTED BY THE WOMEN. (pp.3 - 10.)

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APPENDIX I:	AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.
APPENDIX II:	PLAN OF STORES FOR KNITTING DEPARTMENT.
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I. INTRODUCTION.

A visit was paid to the Workshops of the Sheffield Corporation Welfare of the Blind Department for a period of a fortnight. The workshops moved to new premises in Sharrow Lane on August 25th 1930, though the building is not yet complete.. The official opening of the new premises is fixed for October 23rd 1930.

Throughout the building, ample evidence is available to indicate that consideration of the welfare of the workers is of primary importance. There are only two floors - a ground floor and a lower ground floor. Departments are completely separated from one another by walls, and each department is sub-divided by partitions of about seven feet high. Each department has its own conveniences, while baths have been installed for both men and women. A singular feature of the whole building is that all the doors leading into departments and their sub-divisions are of the sliding variety. Each department has its own storage accommodation for raw materials, and the Mat Department, which receives its raw material in large bundles, has a gantry. The canteens for workers of both sexes and the offices are in the process of completion. The walls are all whitewashed, and windows occupy a large proportion of the wall space in order that full advantage shall be taken of day-light.

A feature of special interest in the policy of the management is that a young boy is employed in each of the three trades - brushes, mats and baskets - conducted by the men. These boys are being trained to become craft instructors in their respective trades.

As much as is possible of the work is paid by piece-rates. Appendix I shows the average wages earned in each trade. The figures have been taken to cover a period of four consecutive weeks, only full working weeks being taken into consideration. The men work forty-eight hours and the women work forty-three hours per week. The men have a break of fifteen minutes in each of the morning and afternoon sessions, while the women have twenty minutes in each session.

The method of paying augmentation to workers is as follows.

Workers earning up to 20/- per week are paid an augmentation of 20/- per week.

" " above 20/- and up to 30/- per week are paid an augmentation of 20/- per week less 2d. per shilling for each shilling earned above 20/- per week.

" " above 30/- per week are paid an augmentation of 20/- per week less 2d. per shilling earned above 20/- but not exceeding 30/-, less 3d. for every shilling earned above 30/- per week.

II. TRADES CONDUCTED BY THE WOMEN.

Six rooms have been partitioned off for the women. One room is used for knitting (flat and round machines) and weaving, one for finishing, a third for chair caning and a fourth for the pupils for these three trades. Of the remaining rooms, one is monopolised by the Harrison triple winding machine, while the other is used for the storage of the raw materials for the Knitting and Weaving Departments.

It is the desire of the management that every journeywoman should have a knowledge of more than one trade, so that during depression in one trade the workers can be utilised in another.

1. Flat Machines.

There are four flat machines in the workroom of which two are 10-gauge and two are 7-gauge machines. The machines are fairly well equipped with modern devices. We understand that a 12-gauge machine is to be purchased.

Each worker on these machines winds her own wool, unless she is using 2/32 quality wool. This is supplied in cone form, and consequently there is no need to wind the material on a bobbin. By permitting each operator to wind her own wool, the Department is not obtaining the maximum production from their machines.

The material is not shaped on the machines. Very little waste occurs in the process of cutting, the departmental head making fairly accurate allowances for the shrinkage of the material when it is taken off the machine.

The picking-in on the machines is performed by the departmental head.

In addition to the usual one, two- and three-piece knitted garments that are made in workshops employing blind labour, some excellent woollen swimming costumes are made here.

2. Round Machines.

The flat machines and six round machines are in the same room. The usual socks and stockings are made. They are first made as the 'open toe' on the machine. The operators then 'graft' them on to knitting needles and complete them. When made in this manner, the finished product is a much better looking article.

There is a sighted assistant in charge of this department.

3. Bobbin Winding.

A partially sighted girl winds the material on bobbins for the round machine operators, but the flat machine workers wind their own, as has already been mentioned. The wool is not waxed during the process of winding.

Occasionally wool was wound by hand. The bobbins so wound were extremely soft, and they tended to become 'soft nosed'. The worker tied excessively large knots. These were the principle faults in the hand winding, and we are convinced that these faults are responsible for delaying the progress of the machine operators. We strongly recommend that every attention be paid to the winding, since wool properly wound and waxed on bobbins is essential for good knitting. The operator on winding has now been taught to tie a reef-knot, which is the best knot for knitting purposes, and is considerably smaller than the one she has been accustomed to tying.

There is a Harrison Triple Winding Machine, but this was not used to its fullest extent, nor were waxing spindles placed on the machine. We are convinced that this machine can feed all the operators on both flat and round machines. At the moment, the output on these machines is restricted. We strongly recommend that the whole question of winding be given the attention of the management. We also recommend that only one skein of wool be placed on 'swifts' for winding on to bobbins.

4. Finishing Section.

Three sighted girls are employed for finishing the garments from the Knitting and Weaving Departments. They cut, use the overlocking machine, and iron in a room apportioned for this section.

There are two irons in this department and both are electrically heated. We recommend that a red bulb be installed over each iron, and that each bulb should be lit to indicate when the current is in use for that iron. This indication prevents waste of current, and reduces the possibilities of fire.

5. Weaving Department.

(i) Warping mill. There is a warping mill which is placed in the pupils' room. It is operated by the partially-sighted girl in charge of the department. A device is attached to the guide by which twelve threads can be wound round the mill at a time.

The warp is taken off the mill, wrapped round a drum, and then beamed. The beam is revolved by hand. There are several holes spaced round the end of the beam, in which pegs are inserted for revolving the beam when wrapping the warp round it. By this method, a warp forty yards long was beamed in approximately thirty minutes. Should the management desire to reduce the time taken to beam, we recommend that several pegs be fixed in the holes in the beam, so that the peg need not be removed from one hole to another. It would be even more desirable to instal a one horse-power motor to perform the operation.

ii. Weaving. There are three looms in the workroom, one of which is a fly-shuttle loom. The bangers of all these looms are hinged at the bottom.

The workers used one foot only for weaving. We recommended the use of both feet, and this was immediately put into effect. We recommend that beginners be taught to use both feet on the looms: it is a more natural movement, and it enables the pupil to progress more rapidly.

There is a considerable amount of side-play in the pedals, which often injures the worker's ankles. To prevent this, we recommend that slots be provided in which the pedals can operate. This may also increase output, but it will certainly free the worker from all thoughts of injury to her ankles.

Chains are used on the fly-shuttle loom to connect the 'healds' to the particular pedals required. On the other looms, cord or string is used, and time is wasted in untying and tying knots when a change of pedal is necessary. To avoid such delays we recommend that all the looms be fitted with chains.

We recommend yet another alteration to the construction of the looms. In the majority of cases, workers actually weave for approximately three minutes. They then have to leave their seats to 'let-down' from one beam and to 'take-up' on another. This break after every three minutes' work does not permit the worker to attain her optimum rate of working. The workers acknowledge that it prevents them from "getting into their stride". We therefore recommend that a device be attached to the looms which will automatically 'let down' and 'take up', and which will thereby permit the worker to maintain her best rate of working.

Spools are made by the weavers by wrapping paper round a spindle. The thread is then wound round this paper. A definite amount of acquired skill is required to prepare such a spool. During the process of weaving, delay is sometimes caused by the thread entangling in the shuttle, preventing it from proceeding across the warp. The shuttle has to be extracted from the warp and the loose thread unravelled and wrapped on to the bobbin. Such difficulties arise when weaving material twenty-two inches or more wide - the broader the cloth the greater being the tendency for these difficulties to occur. To avoid these conditions we have recommended a type of spool, ready made, with raised edges on either side. The advantages of such a spool are as follows.

i. It is ready made and the time required to make a spool is eliminated.

ii. The edges of the spool prevent the thread from slipping off and becoming entangled with the warp.

iii. It is simpler to wind material on a spool of this shape since its edges act as guides.

iv. It will hold a far larger quantity of cotton than the spools now prepared in the department. This produces a garment with a better appearance, since there will be fewer knots in the finished article.

We also recommend the use of shuttles with rollers or runners.

6. Stores.

A room twenty-one feet by twelve feet has been set apart for the storage of raw materials for the Knitting and Weaving Departments. Appendix II shows a plan of this room. In the centre of the room are two long racks of shelves with their backs to each other. This takes up a floor-area space of thirteen feet ~~6~~ six inches by three feet, or forty and a half square feet. By a re-arrangement, three pairs of shorter racks, six and a half feet long can be fitted into this room as shown by the dotted lines in Appendix II. For purposes of comparison, the other dimensions of the racks have not been altered, and yet the new arrangement occupies a floor-area space of six feet six inches by three feet by three feet, or fifty-eight and a half square feet, against forty and a half square feet utilised at present.

There is no demand for greater accommodation yet. The management hope that the Knitting and Weaving Departments will grow and will therefore require greater storage space. A comparison of the dimensions of the racks and of the average sizes of the packets may now be made.

	Average size of Packet containing 3 lbs. of material.	Dimensions of Rack.	
		Present	Proposed.
Height	6 - 6½ inches	15" (for two)	13" (for two)
Length	9½ - 10 "	26" (" ")	22" (" ")
Depth	12 - 13 "	18" (" one)	14" (" one)

From these figures it will be observed that no rack is utilised to its full capacity. In every rack there are four packets and in some racks an occasional packet is thrown between crevices etc. We therefore recommend that when there is a definite demand for more accommodation in this room, the dimensions of the racks be altered to suit the sizes of the packets received from the manufacturers. Taking the present size of packet into consideration, we recommend that the room should be laid-out in the manner shown in Appendix III, with racks of the dimensions previously given. Since the ultimate height of the rack will be reduced, packets can be placed in a single layer on the top shelf. They will be within the reach of the worker.

We strongly recommend that grooves be made in the racks in which partitions could be placed. This would secure a greater flexibility for the storage of any one type of article since the space available can be enlarged or diminished as required.

At present, there is the following accommodation.

A of Appendix II 4 racks 5 tiers high = 12 x 4 x 5 = 240 lbs.
B " " " 5 " " " " = 12 x 5 x 5 = 300 "
C " " " 2 " " " " = 12 x 2 x 5 " 120 "
D " " " 10 " " " " = 12 x 10 x5 = 600 "

1260 lbs.

By the proposed lay-out and revision of the dimensions of the racks as seen in Appendix III there will be the following accommodation.

Plus
top
shelf
A Appendix III 5 racks 5 high = 12 x 5 x 5 = 330+30 = 330 lbs.
B " " 5 " " " = 12 x 5 x 5= 300+30 = 330 "
C " " 2½ " " " = 12 x 2½x 5 = 150+15 = 165 "
D " " 21 " " " = 12 x 5 x 21=1260+126= 1386 "

2211 lbs.

Storage capacity has been increased by 951 lbs. of wool, or 75.5 per cent.

7. Chair Caning Department.

Seats of chairs are remade here, nine journeywomen are employed.

The chairs are placed in vices, so that the girls can utilise both hands for the purposes of reseating. The workers are paid on a piece-rate fixed by the management (See Appendix IV.)

A small tank is placed in the department for soaking the raw materials.

A totally blind girl is in charge of the department.

Training in all trades conducted by the women in these workshops is given in a large room. Girls are taught at least two trades. The minimum period of training given to pupils is three years, but this rule is not rigidly enforced. There are a sighted forewoman and a sighted assistant who are responsible for both the training and the administration of these departments.

III. TRADES CONDUCTED BY THE MEN.

1. Brush Department.

Here both pan and drawn work are performed, but men only are employed in both sections of work. There is a sighted assistant, who bores the stocks of some of the brushes, while the remaining stocks are purchased already bored. Two partially-sighted men are employed on mixing the hair which is purchased 'dressed'. These men perform additional duties of sand-papering the finished brush etc. They are paid on a time wage.

The materials are then ready for issue to the workers.

i. Pan work. There are three 4-strike pans in the workroom. The workers whiten the backs of the stocks and mark their brushes to indicate responsibility for work done. Four workers sit at each table, which is square in shape, each side being fifty-eight inches long. The pans are approximately twenty-two inches in diameter. Heat is supplied by a gas ring placed just below the pan. The jets of flame emanate from holes in the ring, and these rise vertically up to the pan, and a surrounding plate protects the jets from draughts. The vapours are extracted very effectively by an extraction fan through ducts leading below ground level.

Rotary and scavenger brushes are among the many types manufactured in this department. The scavenger brushes are not trimmed here.

The workers fetch their material. Large individual differences between the output of the workers are again revealed in this section of work of the four partially-sighted journeymen in this department. The highest average wage earned is 46/9 per week, while the lowest is 25/4. This evidence, with that obtained from other institutions, tends to indicate that greater attention might with advantage be paid to the methods adopted for the training of the pupils.

Arrangements are being made for the receipt of old and worn out rotary brushes. These will be subjected to a process of steam-heating to soften the pitch. The bass will be removed by hand from the circular stock, which should be cleaned, and will then be ready for refilling by bass to make a completely new rotary brush.

ii. Drawn work. Three men are employed on drawn work, where all types of scouring brushes are made.

The men fetch their material, and trim the 'body' of the brushes. A pair of shears for trimming is placed on the right-hand side of each bench. The 'wings' are trimmed by the sighted management, who also nail on the backs of the brushes and shape them.

All the workers are paid on piece rate fixed by the Brush and Broom Board Trade.

Training for both pan and drawn work is conducted in the next room. Pupils are taught both trades, so that they may be transferable from one section of work to the other. A period of three years is considered sufficient.

There is a sighted Foreman with a sighted assistant in charge of the department.

2. Mat Department.

The usual type of articles manufactured are the ordinary mats such as singles and doubles, wool-bordered and wool mats, kneeling mats, coal bags and Imperial mats.

The raw material is first wound into balls by hand. Two totally blind men are employed on this process of balling, and they are paid on a time wage. The warp is then made from these balls on a warping mill, which is usually operated by the Foreman. The material is taken off the warping mill and beamed by hand. Ninety yards of warp were beamed in ten minutes, four men being required for the task. If a motor were used, it would be necessary to employ only two men.

The beam containing the material is then placed on the loom for the weaver. There are twelve looms. The weavers are paid on a piece-rate which is higher than that of the Coir Mat and Matting Association.

After weaving, the mats are squared and tied by a sighted assistant and a partially-sighted worker. Plaits are then sewn on the edge of the mats by three operators. The mats are sheared on a machine by the sighted assistant. The efficiency of the exhaust fan in extracting the fluff etc. was particularly noticeable in this process: very little, if any, mat dust remained in the room. The mats are finished by hand by a process of clipping.

Plaits are purchased ready-made and are prepared in chains. These are added to the backs of small mats. This completes the process in the manufacture of kneeling mats.

Sinnet mats and coal bags are also made here.

Matting is prepared in this department in natural and in various colours. The coloured yarn is purchased, though we understand that previously yarn has been dyed in this department.

The whole department is under the charge of a sighted Foreman, who has a sighted assistant.

A training department is partitioned off from the main room. Here there are three looms; one of them is an Imperial loom. A period of three years is considered the minimum training period. The training is also under the supervision of the Foreman.

Apart from the wool mats that are made here, the possession of an Imperial loom is of special interest. It is the first of its type we have seen in workshops employing blind labour. The workers found no difficulty in operating it, while the mats produced were of a distinctly better type, both in quality and in their greater variety of design.

3. Basket Department.

Many articles are made here, from small fancy baskets to hampers, chairs and tables.

As is customary in this trade, the operators work with their backs to the wall. There are two rows of workers, with a centre aisle approximately six feet wide. The pitch allocated each worker is about eleven feet by nine feet and is ample for his requirements. Each pitch is marked out by a wood border eight inches high, which prevents one worker from trespassing on to the floor space of his neighbour.

Some of the workers use guides to assist in preparing both square and round work, while a few devices have just been prepared to assist in the manufacture of chairs and tables. Bodkins are pierced through the bottoms of baskets on to the planks to facilitate manipulation in the process of manufacture.

Three workers are employed on sorting and fetching material, and on finishing. The journeymen cut their own stakes and pick their baskets.

The workers are paid on a piece-rate fixed by the

Yorkshire Employers Cane & Willow Workers' Association.

There are two tanks for soaking material, both of them are on the lower ground floor. One of these can be utilised for soaking in both hot and cold water.

Cane is stored in lockers the size of which depends on the length of the material. Lockers are used to prevent the cane from discolouring.

There is a sighted Foreman and an assistant in charge of the department, and they are responsible for the training of the pupils, for whom the minimum training period is three years.

IV. RETAIL SHOP.

The workshops possess a retail shop which is situated in West Street - not quite in the shopping centre of the city. The various articles for sale are most attractively displayed both in the windows and in the shop itself. It is the most attractive shop we have seen attached to a blind workshop.

Throughout the factory, we observed the contentedness of the workers. There was an atmosphere of friendliness in each department, not only between the workers, but between workers and management. Each worker has the 'ear' and sympathy of the Trade Manager before whom all complaints are placed. Here full consideration is given. It is because the workers realise this that they are so happy and contented.

We wish to express our thanks to Miss E. S. Watts, the Superintendent, to Mr. W. A. Cooke, the Trade Manager, and to the entire staff for their co-operation and assistance to our investigator during his visit.

November 26th 1930. (Signed) H.Ward
For Director.

APPENDIX I.

AVERAGE WAGES EARNED BY WORKERS IN THE VARIOUS TRADES.

Departments.		Average wages earned per week per worker by. Partially Blind.	Totally Blind.
Women (Trades include Flat and Round Machine Knitting, Weaving and Chair Caning)		12/9 (5)	14/- (10)
Brush.	Pan Section	32/6 (4)	23/1 (6)
	Drawn Section	-	10/10(3)
Mat.	Weavers	53/9 (2)	37/6 (6)
Basket		21/5 (5)	22/3 (9)

The numbers in brackets are the number of workers from whose wages the average wage is calculated.

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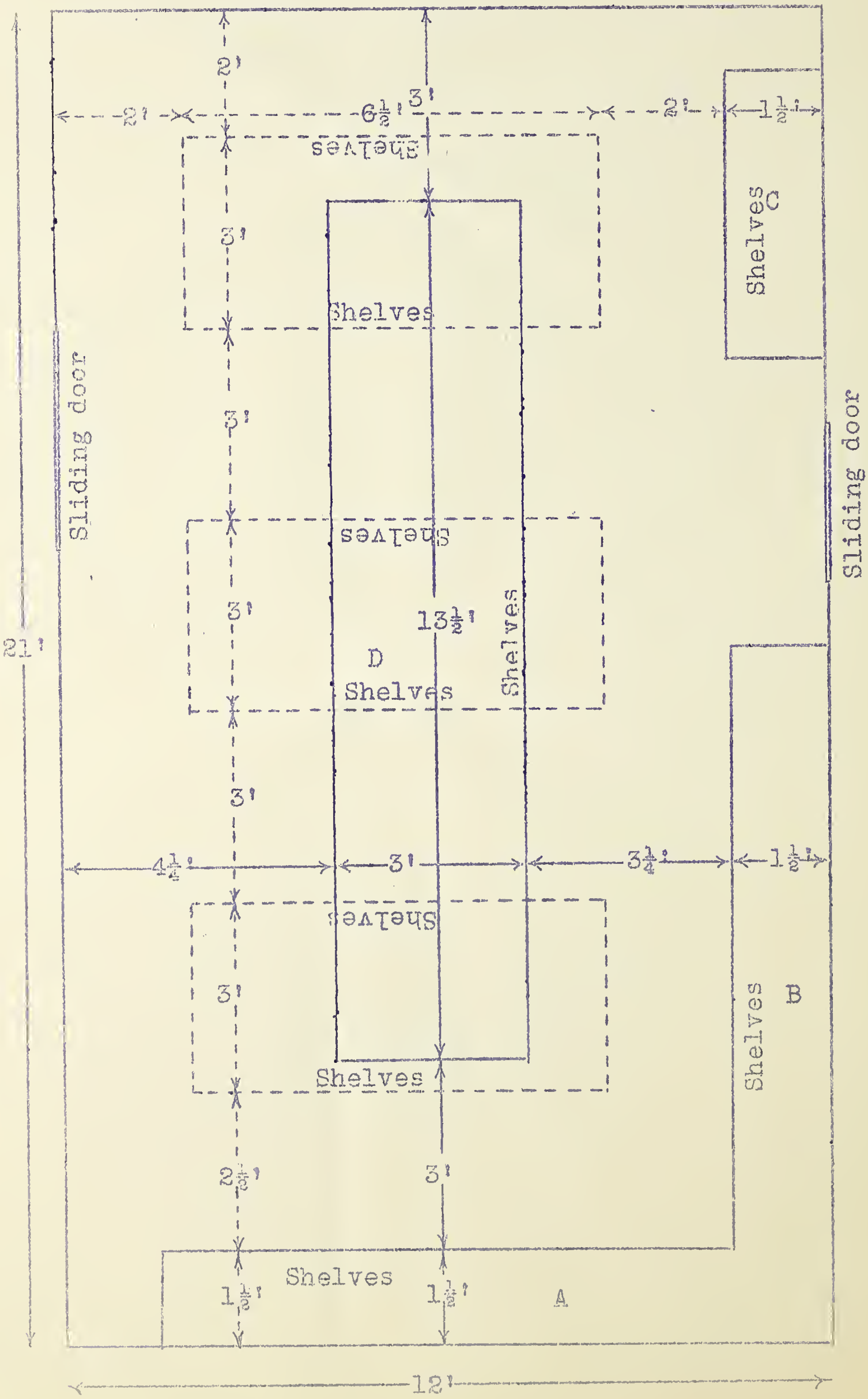
APPENDIX II

PLAN OF STORES FOR KNITTING DEPARTMENT

(Scale 1"=30")



Proposed lay-out of racks in dotted lines

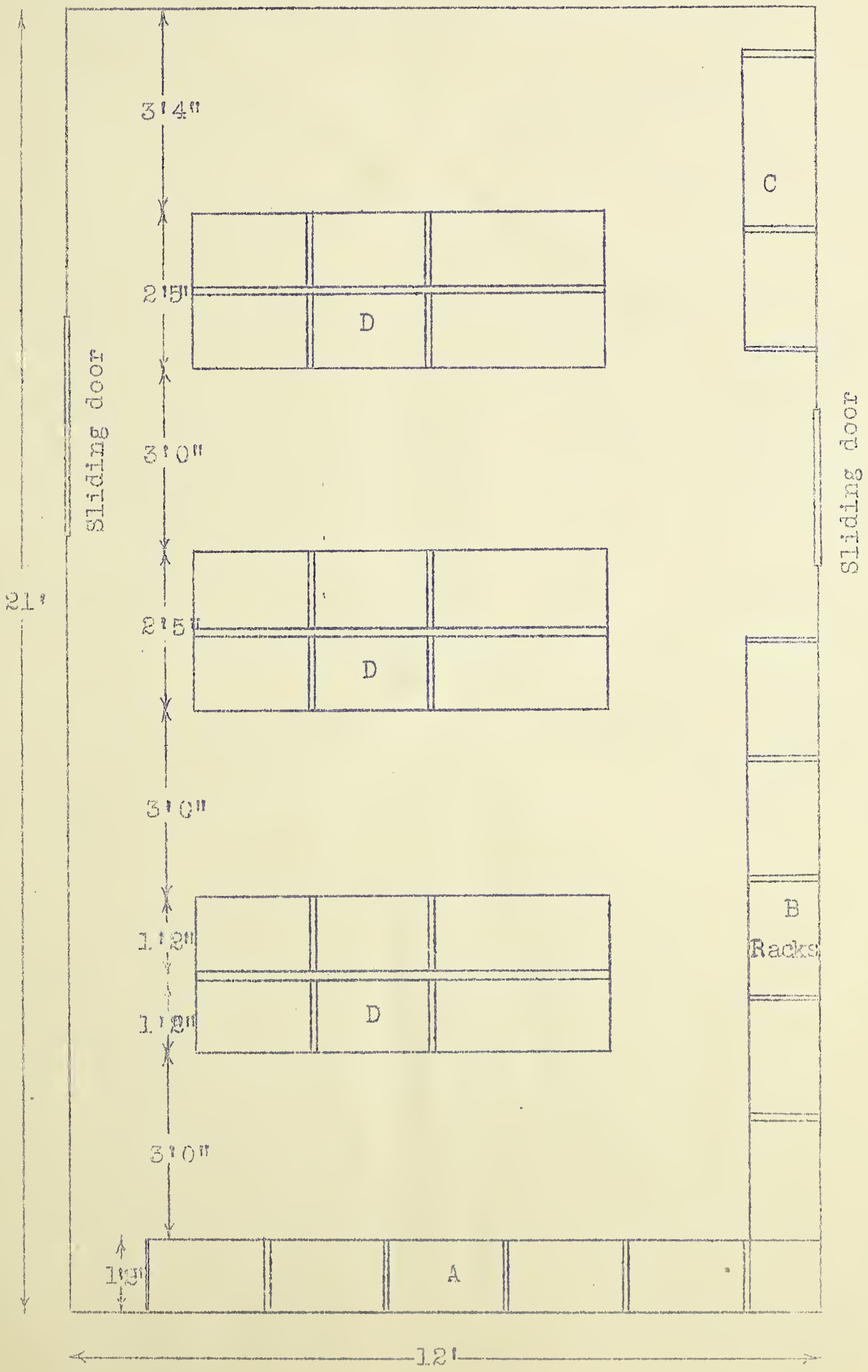
E.J.R.

R302

APPENDIX III

PROPOSED PLAN OF STORES FOR KNITTING DEPARTMENT

(Scale 1"=30")



E. T. R.

APPENDIX IV.

PIECE RATES FOR CHAIR CANING DEPARTMENT.

16	holes	back,	20	holes	front,	16	holes	side	1/3	per	chair.
18	"	"	24	"	"	18	"	"	1/4	"	"
18	"	"	24	"	"	19	"	"	1/5	"	"
19	"	"	25	"	"	19	"	"	1/5	"	"
20	"	"	24	"	"	20	"	"	1/6	"	"
20	"	"	24	"	""	21	"	"	1/7	"	"
21	"	"	25	"	"	21	"	"	1/8	"	"
22	"	"	28	"	"	22	"	"	1/9	"	"
22	"	"	28	"	"	23	"	"	1/10	"	"

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NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

R310

Report of Investigation

~~AT~~
TO THE

NATIONAL INSTITUTE FOR THE BLIND

ON THE

BASKET, WEAVING AND KNITTING TRADES.

as conducted by

WORKSHOPS FOR THE BLIND.

Investigator: C.B.Fox.

I. INTRODUCTION. (pp.1 - 3.)

II. SUITABILITY OF TRADES CONDUCTED BY THE BLIND. (pp.4,5.)

III. BASKET TRADE. (pp.6 - 13.)
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    iii. Allocation of space in tanks. (p.8.)
  2. Processes. (pp.9 - 11.)
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    ii. Layout of raw material. (p.11.)
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  2. Bobbin Winding Machines. (pp.17,18.)
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V. KNITTING TRADE. (pp.23 - 32.)

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    i. Triple machine winder. (pp.23,24.)
    ii. Six-spindle machine. (pp.24,25.)
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  2. Knitting.(pp.25 - 29.)

    i. Flat machines. (pp.25-28.)
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    iii. Allocation of workers to machines. (p.29.)
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  3. Finishing Section.(pp.30 - 32.)

    i. Importance of first pressing. (p.30.)
    ii. Safety and economy in use of electric iron. (p.30.)
    iii. Method of dealing with orders. (p.31.)
    iv. Records of output. (p.31.)
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  4. Costing. (p.32.)

APPENDIX I. NAMES OF BLIND WORKSHOPS VISITED.

APPENDIX II. OUTPUT CURVES.

APPENDIX III. DATA RE BASKET TRADE.

APPENDIX IV. " " KNITTING TRADE.

APPENDIX V. " " WEAVING TRADE.

APPENDIX VI. JOB CARD & COSTING CARD.

I. INTRODUCTION.

The services of the National Institute of Industrial Psychology were engaged by the National Institute for the Blind for research into the problems of the employment of blind persons. For practical purposes, the field of research was divided into five main sections.

1. To examine blind workshop methods with regard to (a) management, (b) marketing.
2. To explore the possibilities of developing new industries in existing workshops for the blind, or in connection with them.
3. To explore the possibilities of developing new industries on a sub-contracting basis, either in existing workshops or in workshops for the blind planned for manufacturing articles or components used by manufacturers.
4. To discover operations or processes suitable for the blind in factories employing sighted labour.
5. To devise means of increasing the number of blind entrants into professions already known to be suitable, or into others not hitherto entered by the blind.

Problems concerned with Sections 3 and 4 are discussed in Bulletin No. 1 of the National Institute for the Blind. The present report deals with some aspects of the first problem. Although the two sub-sections - management and marketing - are closely related, each must be considered separately in this report. Only when the problems under each sub-section have been fully dealt with can the relationships of one sub-section to the other be considered. For this purpose, the problems of management only have been studied in the trades of basket making, knitting and weaving.

These trades have been studied in detail, and in order to determine whether local conditions necessitate modifications in the application of general principles, visits were made to various workshops for the blind enumerated in Appendix I. Facilities have been given without which this digest could not have been prepared. Accordingly, we wish to thank the management and staff of these workshops for their assistance and co-operation in the preparation of this report.

Throughout this report, we lay stress on methods of increasing production and on all economic factors governing mass production. The reason for this is to decrease the unit cost of production in order to obtain a market which is not available if production costs are high. The ultimate aim is to enable workshops to employ more blind persons.

Figures are furnished in Appendices III, IV and V, giving the number of workers employed in the trades under consideration, together with the wages earned, the augmentation paid to workers, and the type of articles produced. Noticeable features are that workers in the basket trade in general earn higher wages than in either the knitting or weaving industries and that the period of training for this trade is longer than for any of the others.

The methods adopted by institutions for paying augmentation to workers differ widely. This is due to the fact that the amount paid in augmentation is often dependent upon local conditions. Institutions Nos. 1 to 5 (Appendix I) are in the same town, and all workers receive the same augmentation. Some institutions which are near each other base their method of payment on sliding scales, and these scales differ widely from one institution to the other.

An important feature in the Appendices III, IV and V is the number of blind workers employed in workshops to each sighted member of the staff of that trade. The larger the number of sighted staff employed in a workshop, the greater are the possibilities for assisting the blind workers, and consequently the greater is the likelihood of the wage earnings of the blind workers being increased. Although the ratio of sighted staff to the number of blind workers is given, a comparison of the figures of one institution with another cannot be made, since the conditions are not identical. The piece rates on which workers are paid, and the number of hours which are worked in a week differ considerably. Another point which must be considered in dealing with wages earned, but which cannot be treated statistically, is the effect on the output of workers when there are few orders received. In such a case, workers tend to slow down, while workers in a workshop which is fortunate in receiving orders for many articles, complete these orders at their best rate of working. It is because of these varying factors that no direct comparisons can be made from the figures in the appendices.

II. SUITABILITY OF TRADES CONDUCTED BY THE BLIND.

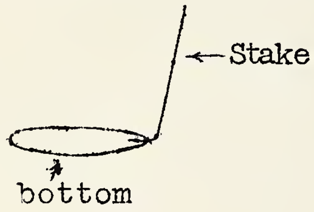
No definite experiments have yet been made to determine which of the trades conducted by the blind are the most suitable for them. In each of the trades mentioned in this report, there are processes which the blind find difficult to perform, while there are some which, it is recognised, should not be performed by the blind. Most of the difficulties of the former type of process are overcome by mechanical devices, while sighted persons are employed on the latter type. In this manner, trades which offer great difficulties for blind workers are now made possible for them. The present factors which determine the suitability of a trade for the blind are whether the blind are capable of earning a living wage in these trades, and whether such a trade can be maintained economically. Appendices III, IV and V contain the average wages of the workers in the various trades mentioned both for partially and for totally blind workers. The augmentation paid to workers is also given in these Appendices, together with the period of training necessary for each trade. This last information serves as a slight indication the difficulties experienced in teaching the various trades to blind workers. For example, the average period required for training workers in the basket industry is approximately 3.6 years, while weaving and knitting each requires 3 years. This seems to indicate that the basket industry offers greater difficulties to blind workers than either the knitting or weaving industries, and the period of training is accordingly longer. And yet the Eighth Report of the Advisory Committee on the Welfare of the Blind states that of the 9548 blind workers employed in England and Wales 1958 are employed as basket and cane workers, 1066 are employed as knitters, 725 are employed as mat makers, and 448 are employed as brush makers.

The figure for weavers, though small, was not mentioned. The above figures show that there are nearly twice as many basket workers as knitters, the next largest group. This gives further proof that the suitability of a trade is not dependent only upon the difficulties of its processes. In fact, the possibility of marketing the products is the main factor in determining the 'popularity' of any trade.

The whole future of the various trades depends very largely on the successful solution of the problem of marketing. We therefore studied local conditions which might affect this problem - such conditions as the position of the retail shop, the method of securing wholesale orders, etc., and we have recommended measures for increasing sales. But the whole problem of marketing must be examined in detail before the question of the suitability of each trade can be discussed at any length.

III. BASKET TRADE.

Baskets are generally prepared from canes and willows, which are first soaked in water-tanks to make them more pliable. They are then given to the basket-maker, who first prepares the bottom of the basket. The next process is known as the staking and upsetting. Great care must be taken here, for the correctness of shape of the basket depends entirely on the process of staking being well performed. One end of the stake is placed into the bottom of the basket. The stake is then bent upwards, the bend being made near the bottom. There may be as many as seventeen or eighteen stakes to a basket, and these determine the ultimate shape of the basket. Material is then woven round these stakes, and this is known as siding. The work of siding is simple once the staking has been performed correctly and securely. Above the siding is the border. On completion of the border, the basket is ready to be finished by fixing padlocks, bolts and rollers, and by 'picking', i.e. by cutting off all protruding ends.



1. General Lay-out.

Blind workers in the basket industry generally sit in two rows down the length of the room with their backs to the wall. Each worker is allocated a definite space for the preparation of his basket: the area varies from one institution to another. This space is known as the PITCH. Each pitch is marked out by partitions usually eight inches high, to prevent one worker from trespassing on the floor space of his neighbour.

The size of the pitch varies. In one workshop the allowance made is 8 feet by 7 feet 6 inches, while in others it is 11 feet by 9 feet. A worker certainly requires a larger area when he is preparing large hampers, skips etc. than when he is working on small fancy ware. But since workshops cannot guarantee their workers the same type of work continuously, arrangements have to be made to allocate sufficient space for the preparation of the largest type of basket that is produced. We are of opinion that a pitch nine feet square is ample for a basket maker preparing the ordinary sized hampers produced in workshops for the blind.

The workers sit on wooden 'planks', and at the head of each pitch, near the wall, is placed a wooden box containing the tools of the basket-maker. The raw material from which the worker prepares his basket is kept on either side of the 'plank'. Occasionally, workers sit on the box containing their implements in order to obtain a better 'purchase' - in order to use more force in preparing the basket.

Since workers generally sit in two rows facing each other, it is customary to have an aisle down the middle of the room to permit easy access to the pitches.

(i) Position of tanks. It is customary to place the soaking tanks within easy access of the workroom, so as to reduce the time required to reach them. For the same reason, the stores both of raw material and of the finished product, should be near the workroom.

(ii) Temperature of water in tanks. The water in these tanks sometimes freezes in the winter months, and the removal of material from them becomes a difficult and unpleasant task. It affects the individual who has extracted the material to the extent of preventing him from working for some considerable time - until his hands and fingers have lost their numbness. Moreover, the material becomes less pliable, and longer soaking is necessary in cold than in warm water. We therefore strongly recommend the warming of the water in the tank, particularly during the winter months.

(iii) Allocation of space in tanks. We also recommend that different parts of the tanks be specially allocated for the various types of raw materials used, so that the worker requiring fresh material from the tank knows exactly where to obtain it. He would then waste no time in searching amongst the material in the tank. We recommend that space be allocated for -

Cane Work.
- (a) Staking
- (b) Siding.
- (c) Finishing.

Rod Work.

Semi-Finished Work..

It is advisable that the tanks and the path leading to them should be placed under cover to protect the workers from inclement weather.

iv) Method of storage. The raw material in the stores should be so placed that every bundle of raw material should be accessible without interfering with any other bundles. In many institutions, bundles are placed crossways upon one another, so that it is often necessary to remove many bundles before the one required can be extracted. Much time and labour is thus wasted.

We recommend that the method of placing bundles in layers be continued, but that each layer be placed on a shelf. Any bundle can then be extracted without moving any other bundles. It is true that more accommodation will be required when these shelves are installed, but the extra space used will be small and will be more than compensated for by the saving of time and labour which would result.

2. Processes.

Raw material is first sorted on receipt of consignments in the workshop. Quantities are drawn from the stores as required.

In some institutions, one of the sighted staff is deputed to cut the stakes, while in others the workers cut their own stakes. The stakes are much thicker than the cane or willow used in the baskets. Should a stake be spoilt through bad cutting and shaping, a heavy waste of raw material results. When each worker cuts and prepares his own stakes, a large amount of waste is inevitable. Although this waste is considerably reduced when a sighted person cuts the stakes, it is yet uncertain whether this reduction compensates for his higher wages. It has not been possible to carry out experiments on this point, but some workshops employ a sighted man for this purpose. We are of the opinion that it would be economical to train a sighted youth to perform this and other duties.

The method of issuing the raw material to workers differs in various institutions. In some, the blind workers have to go to the stores to receive material from a sighted person responsible for its issue. In others, the raw material is brought to the pitches. The procedure for the soaking of material is somewhat similar: some institutions employ sighted persons, while in others the blind workers themselves soak the fresh material immediately on issue. We recommend that the sighted youth employed for cutting stakes, should be given these additional duties. This will permit the workers to remain at their work and will thereby increase the time available for actual manufacture.

Workers are paid on piece-rates usually fixed by the Board of Trade, and since these piece-rates have been determined only for the preparation of complete baskets and not of portions of baskets, it is customary in all blind institutions for each worker to start and complete his own basket.

i. Sub-division of labour. In practice, it is found that some workers are unable to prepare all the types of baskets produced in the department. If, therefore, orders are received only for those baskets which they cannot prepare, they have either no work to perform, or they must make baskets for stock, in the hope that there may be a demand for them later. But when the stock of such baskets is already considerable, the sole reason for increasing it is to keep such workers employed. And this may be definitely uneconomic. If, however, the manufacture of a basket were divided into four parts - the bottom, the staking and upsetting, the siding and the border - it might be found possible for these workers to construct one part only of the basket. In the preparation of a basket, once the staking and upsetting has been well performed, the next process, siding, is a simple one, and could be performed easily by those men who are unable to make a complete basket. If workers constructed one portion only of the basket, it would be possible to continue making those baskets for which there is a specific demand, and yet to employ all the poorer workers. There would then be no necessity for the uneconomical policy of preparing baskets for stock to keep these poorer workers employed.

An experiment on this sub-division of labour was conducted in a workshop. Four men, who were all capable of preparing a basket individually, each prepared only one of the four parts of the basket. The material for the baskets was prepared for the workers. Since the men were not working alongside each other, each section of the basket which had been completed by one man was taken to the next worker. This transport of the parts could, of course, be greatly reduced in future team-work of a similar character. After making due allowances for the preparation of material and for any assistance in finishing, their output was 25.2 per cent. higher than when each completed his own basket.

The regularity of the flow of production was a very marked feature of the experiment and would greatly facilitate the delivery of orders ~~for~~ by a fixed date.

ii. Layout of raw material. Time is wasted by the blind workers in groping for their implements or for their raw material unless specific attention is paid to the positions to which these are allocated. In practice, the worker places his raw material on both sides, and he often fumbles to find his next piece. As an experiment, a rack was designed to contain raw material. Since the material was placed in a definite position it could be easily withdrawn and consequently, the time available for actual work in production was increased. An increase in output of ten per cent. was obtained in this manner. We therefore recommend that suitably designed racks to hold raw material and tools be introduced into all workshops.

iii. Mechanical devices to assist in the preparation of baskets.

(a) Installation of 'Bodkins'. Workers sit on their 'planks' while preparing their baskets which are placed on 'lap boards'. Some workshops, however, have 'bodkins' firmly placed on these planks. Once the bottom of the basket has been prepared, and the staking and upsetting has been completed, the 'bodkin' is thrust through the bottom, so that the basket may swivel round it. Work is thereby facilitated, since both the worker's hands are free. We recommend that this method be adopted in all workshops.

(b) Installation of mechanical devices. In some institutions, workers use metal guides to assist them in preparing both square and round work. Every endeavour should be made to introduce in all workshops any mechanical device which assists either in the preparation of baskets, or in the preservation of their shape.

3. Supervision.

In some workshops, baskets are inspected by the sighted staff, and either passed or returned to the worker for correction. This method wastes time, labour, and sometimes material, since the errors are detected only when the basket has reached an advanced stage. In other workshops, however, the sighted staff maintain a continuous inspection of the work in progress. They detect the errors as soon as they are made, and so prevent the worker from continuing on an already incorrect basket. Considerable losses of time and labour are thus saved. In addition the sighted staff warn workers immediately difficulties appear, ~~and~~ instruct them how to overcome these difficulties, and so prevent the occurrence of errors.

Time is wasted in many workshops between the completion of one basket and the commencement of another, because the raw material has not been placed in the tanks early enough for it to have become thoroughly soaked and pliable. An effort is often made to prevent this waste by ~~the worker~~ using the material while still inadequately soaked. But in fact this is useless, for the working rate with unpliable material is much slower than with properly soaked material. With the method of continuous supervision it should be easy to arrange that the material is thoroughly soaked by the time it is required.

For these reasons, we strongly recommend that the method of continuous supervision be used in all workshops. The additional cost would in part be met by a higher output of better quality work. Moreover, the workers would be more contented when fully employed.

i. Variations in output due to change of work. Experiments were conducted in a workshop, where the workers were frequently changed from one type of work to another to determine what effect these frequent changes had on the output of the worker.

Certain workers made a definite type of basket for a few days, and they were then given a different type to prepare. After a few days, they again reverted to the earlier type of work, and then changed back to the later type. During the first period of work output increased. A change of work was introduced, and this, too, resulted in an increase in output. On reverting to the first type it was found that the worker's rate was higher than when he originally began, and that the production increased during this working period. A typical example is shown in the graph in Appendix II. The results indicate that there is here a field for further experiment, for which, however, we had no opportunity. In general, it is quite definite that seven days is not a sufficient time for attaining the maximum rate of work on a single type of basket. We therefore recommend that changes from one type to another should not be introduced until at least a week has passed. Should the changes be more frequent than this, the full efficiency of the worker is not utilised.

4. Finishing Section.

In many workshops, no definite room is allocated for the finishing of the baskets. In some, the blind workers are responsible for most of the finishing (i.e. picking, singeing of fancy baskets, etc.). In some workshops only a small area is allocated for the finishers to put on rollers, bolts, and the metal additions which make the basket complete. Such finishers are usually sighted persons. Workshops vary in their policy - some leave a great proportion of the finishing to these sighted persons in order to improve the appearance of the article to make it saleable, while others depend more upon the supervision of the blind workers while at their work so as to manufacture the article correctly from the initial stage. In the latter case, little or no finishing by sighted workers is required.

IV. WEAVING TRADE.

The trade of weaving can be sub-divided into three distinct processes.

1. The preparation of the warp, which is performed on a warping mill.
2. Weaving on looms.
3. Finishing the material woven into definite articles.

1. Warping Mill.

Material for weaving is first prepared on a Warping Mill, usually constructed in wood, circular or hexagonal in shape and from five to six feet in diameter. In its centre is a vertical spindle round which it revolves.

In order to prepare the warp, thread is wound round the mill. The thread first passes through a guide and then round the mill. As the mill revolves, the guide gradually descends. In this manner, threads of great length are wound round the mill, the length depending on the number of revolutions of the mill. The thread is then crossed over on pegs on the mill, and the mill revolves in the reverse direction (the guide ascending) until the same length has been wound round the mill as on the downward journey. The number of journeys (up and down) travelled by the mill depends on the desired width of the material. The narrowest width of cloth woven is usually eighteen inches. Since there are approximately twenty-two threads to the inch, material of eighteen inches width will require 396 journeys. To save time, many workshops use two threads at a time for preparing the warp. The time required when a single thread is used is nearly double that when two threads are used.

Device for increasing production by use of twelve threads. A device to be attached to the guide has been constructed, and is used in one of the institutions visited, for crossing the threads over the pegs on the mill. With it, twelve threads of the same colour can be used together, and output can be increased by at least eighty per cent. over that when two threads are used. The device is extremely cheap. We strongly recommend its utilisation on all warping mills.

ii. Indicator to assist totally blind workers. In all institutions visited where weaving is conducted, the warping mill is turned by hand, sometimes by a partially sighted and sometimes by a totally blind girl. From our observations, no difficulty was experienced by the partially-sighted workers who were able to see the thread. But with totally blind workers the speed varied considerably, the rate diminishing markedly towards the end of the journey, especially on the downward run. This great reduction of speed was due to the anxiety of the totally blind worker not to go beyond the requisite distance. In order to prevent this reduction of speed, we recommend that ~~our~~ an indicator - an adjustable bell, for example, - be attached to the slide on which the guide runs. This bell would notify the operator when she is just at the end of the journey. An indicator of a temporary character was devised in one workshop, and the workers found it of great assistance. With sighted or partially-sighted workers such an indicator is not required.

iii. Allocation of duties. It is customary for workers to prepare their own warps. This duty of warping is performed by each operator approximately once in twenty days. Since a warp requires, on an average, a day to prepare, the weavers have little time to acquire any marked skill. Immediately some slight skill is being developed, the weaver has completed the warp and returns to her main duty of weaving.

By the time she prepares her next warp, she has completely lost the skill she previously acquired, and her rate of production on the mill is consequently very low. We strongly recommend that one girl should prepare all warps. She will become very skilful at the work, and much less time will therefore be spent on it. If she is not continuously employed other duties may be given her. Pride in having a definite machine under her care and satisfaction in having a definite duty to perform will give added interest to her work.

In many workshops, it is considered desirable that the workers should know the various operations in their respective departments, and the weavers therefore prepare their own warps. We are of opinion that the policy is an extremely sound one, but, once each weaver knows how to prepare a warp, there is no necessity for her to continue doing so. Once the principle of the process is known and understood, there is no further reason for the worker to perform it, particularly when performing it means a reduction of the output of the mill. Moreover, while they are working at the mill, there is one loom more in the factory which is not in use. The loss therefore is a double one: the rate of output of the mill is low, and no output is obtained from the loom while the worker is preparing her warp.

When the warp is prepared, we recommend that the material should be wound round a drum direct from the mill, and then wound round the beam of the loom. We recommend that both processes, and particularly the latter should be preformed with the aid of a motor. The number of persons required would then be reduced. There are other methods employed in the workshops for 'beaming' the warp, but these have been introduced because of such difficulties as lack of equipment, shortage of floor space etc. Could these difficulties be overcome, we are convinced that the workshops will derive greater benefit by having all warps prepared by one worker and by having the beaming performed by motor. In one workshop where this arrangement has been adopted, the time required to beam a warp forty yards in length was about half an hour, although the warping mill was worked by hand. The time for the same length to be performed by hand only is about one or one-and-a-half hours.

2. Bobbin Winding Machines.

The instruments used for winding bobbins are usually of the Norwegian design, and are very simple in construction. They can be manipulated easily by the blind workers. Owing, however, to the very small diameter (2½ inches) of the wheel driving the screw spindle, there is an undue expenditure of energy with each turn of the handle (2⅜ inches radius). When new winders are purchased, we recommend that the wheels should be at least six inches in diameter, and that the machines should have automatic guides for the thread similar to the device fitted to sewing machines for winding bobbins.

i. Type of spool. The spool on which the cotton is wound for the process of weaving is made of paper, and skill is required to prepare it. During the process of weaving, delay is sometimes caused by the thread entangling in the shuttle and preventing it from passing across the warp. The shuttle has to be extracted from the warp and the loose thread unravelled and wound round the bobbin. Such difficulties arise when weaving material twenty-two inches or more wide - the broader the cloth the greater is the tendency for these difficulties to occur. We strongly recommend the use of wooden spools ready made, with raised edges on either side. The advantages of such a spool are as follows.

i. It is ready made and the time required to make a paper spool is eliminated.

ii. The edges of the spool prevent the thread from slipping off and becoming entangled with the warp.

iii. It is simpler to wind material on a spool of this shape since its edges act as guides.

iv. It will hold a far larger quantity of cotton than the paper spool usually prepared in the workshops, so that the woven garment contains fewer knots than one made with material on paper spools, and has therefore a much better appearance.

3. Weaving.

i. Throwing the shuttle. Weaving is performed by throwing the shuttle by hand on looms, most of which are of the Swedish pattern. If the shuttle is thrown incorrectly, it sticks between the layers of the warp, or falls through the warp to the ground. Workers take special precautions to prevent this: they steady the hand before releasing the shuttle to ensure that it will pass between the layers without mishap. This steadying occupies a very short period of time - on the average about one-fifth of a second - and it varies with different operators. With some, only this momentary steadying effect is noticeable. Others, however, make a distinct movement as if the shuttle were to be thrown in one clean sweeping action, but they then withdraw the hand a short distance, and after an instant's hesitation make the final throw. The average overall times taken by a group of workers to throw the shuttle are as follows.

(a) 1.6 seconds to throw a distance of 18 inches.
(b) 1.9 " " " " " 36 "
(c) 2.3 " " " " " 48 "

If the hesitation could be avoided, there would be a reduction in time for the respective widths of

(a) 0.2 seconds, corresponding to an increase in production of 14.3 per cent
(b) 0.2 " " " " " " "11.8 "
(c) 0.2 " " " " " " " 9.5 "

The workers find it difficult to eradicate this superfluous movement. If, however, a ledge were placed on the banger under the threads, it would give the operators a sense of security in their throwing, and so enable them to dispense with this auxiliary movement. Such ledges are fitted to all looms using fly-shuttles.

ii. Use of feet. Looms are usually provided with three pairs of pedals (usually narrow strips of wood from one to one-and-a-half inches in width). The workers generally employ only one foot: some use the right, others the left, while a few change from one foot to the other when tired. The use of one foot only is extremely awkward and must be more tiring to the worker than the regular use of both feet. Moreover, in the initial stages of learning, an undue amount of time is occupied in finding the correct pedals. The use of both feet is a much more natural movement, and training is much more rapid if both are used. To permit the use of both feet, however, the looms require slight structural alterations. When one pedal - the right for example - is depressed, the left pedal rises. But the beam which receives and winds the completed work is so placed that the left knee comes into contact with the material and is prevented by it from ascending to the limit of its stroke. It is probably because of this obstruction that pupils have been taught to use only one foot. We recommend that the receiving beam be raised sufficiently to permit free movement of both knees, without interfering with the action of the 'banger' and that all weavers be trained to use both feet.

There is a considerable amount of side-play in ~~the~~ pedals, which often results in injury to the worker's ankles. To prevent this, we recommend that slots be provided in which the pedals can operate. This may tend to incrase output, but it will certainly free the operators from all fear of injuring their ankles.

Cord or string is generally used to connect the 'healds' to the particular pedals required, and time is wasted in untying and tying knots when a change of pedal is necessary. To avoid such delays we recommend that chains or leather 'thongs' and hooks be fitted to all looms for this purpose.

iii. Automatic 'take-up' and 'let-down'. In order to obtain more warp material, the weaver has to leave her seat and go to the back of the loom to release or 'let-down' the beam on which the warp threads are wound. She then 'takes-up' the completed material on another beam at the front of the loom. Time studies have revealed that the quantity of thread let-down permits the girl to work continuously for a maximum of about three minutes, after which the process has to be repeated. With slight structural alterations to the loom, this process of 'taking-up' and 'letting-down' could be performed automatically, as it is performed on the fly-shuttle loom.

In light repetitive work of this character, short working spells of two to three minutes do not permit the operator to develop a natural working rhythm. It has been suggested that the break after two or three minutes serves as a useful rest-pause, and reduces the effects of monotony. We agree that definite rest-pauses are essential in work of this character, but we do not consider that any advantage is gained when they are taken at such frequent intervals. We strongly recommend, therefore, that an automatic 'take-up' and 'let-down' be introduced. Such a mechanism would eliminate the frequent involuntary stoppages which at present occur, and would affect a very substantial reduction of unproductive time. The introduction of suitable rest-pauses could be considered on the basis of a careful scientific study of work curves.

iv. The fly shuttle loom: its advantages and disadvantages. The operation of the fly-shuttle loom differs from that of the Swedish loom in that the former is operated by pulling a string at the centre of the loom to send the shuttle through the warp, while the shuttle of the Swedish loom is thrown by hand. Pulling a string is an easier movement for a blind worker than throwing a shuttle. We are convinced that, with proper instruction, the advantages of a fly-shuttle loom over a handloom would soon be demonstrated, since

(a) the movements required to manipulate a fly-shuttle are much easier and quicker than those required to throw a hand-shuttle;

(b) the time necessary to teach the operators to pull the string is very much shorter than the time taken to teach them to throw the shuttle; and

(c) the output of the fly-shuttle loom is much greater than that of the Swedish loom.

We realise that a larger floor space is required by fly-shuttle looms. An extension of from fourteen to eighteen inches on both sides of the loom is necessary for the shuttle. This means that each fly-shuttle loom requires about three feet (in width) more floor space, but we are convinced that the increased output obtained from it will more than compensate for the additional floor space occupied by it.

In one workshop where a fly-shuttle loom was in operation, timings revealed an average of 20.4 seconds for ten throws against an average of 22.36 seconds on a hand-shuttle loom for the same width of material for the same number of throws . The day on which these timings were recorded was only the second day of the worker's experience of a fly-shuttle loom. A week later, however, timings were again taken, and these showed an average of 17.7 seconds for ten throws, or an increase of 26.3 per cent. on the output obtained from the hand-looms.

4. Finishing Section.

After the material is taken off the looms, it is inspected by the Finishing Section. Sighted workers are employed here, and they correct any small defects which have been made by the operator on the loom, and cut the cloth into the lengths required for articles being made.

All the weaving departments which were visited contained so few workers that the finishing of the material from the looms was performed sometimes by the finishers of the Knitting Department, and sometimes by the supervisors of the weavers themselves. Only in one institution were there any workers who were fully occupied in finishing: there were four finishers for thirty-eight weavers.

V. KNITTING TRADE.

This trade is divided into three distinct major processes.

1. Bobbin winding which consists of winding material such as wool, silk etc. on to bobbins.
2. Knitting the material on the machines.
3. Finishing. The material is taken off the machines, and cut and shaped. Collars, belts, buttons and pockets are sewn on to the garments.

1. Bobbin Winding.

It is important that every care should be taken to ensure that wool is well waxed and properly wound on to bobbins. This is essential in order to make the subsequent process of knitting a success.

Wool is frequently wound on to bobbins by hand, particularly in the smaller workshops. By this process not more than one bobbin can be wound at one time by an operator, and this obviously is much slower than the winding of several bobbins at the same time. There are two other methods in existence for winding bobbins - a triple machine winder and a six-spindle machine.

i. Triple machine winder. This hand-operated machine winds three spindles at the same time. Should, however, the wool break on one bobbin, the operator has to stop winding while attending to this bobbin. Similarly, she must stop while changing bobbins etc. At these times all three spindles are idle, and the efficiency of the machine is impaired. If it were mechanicallydriven, the operator could devote her whole time to ensuring that the winding was not interrupted.

Some workshops employ totally blind, some employ partially-blind, and some employ sighted persons for bobbin-winding. When using a machine having three or more spindles, it is necessary to have sight in order to ascertain if all the spindles are winding. With a worker who has little sight, it is difficult to know whether a spindle which continues to revolve is actually winding. Consequently, we recommend that no blind girls or workers with little sight should be employed on a machine winding three or more bobbins. To obtain the maximum efficiency from such machines, completely sighted persons should be employed. A sighted person, however, would not be fully occupied in attending three spindles, if the machine were mechanically driven.

ii. Six-spindle machine. Two types of workers - fully sighted and very slightly blind girls - have been observed in a workshop where mechanically driven six-spindle machines are used. The fully sighted workers produced better and more efficient work. Since three spindles cannot employ a sighted girl fully, we recommend the installation in workshops of mechanically driven six-spindle machines. Each girl should be given one machine to feed.

It is essential that not more than one skein of wool should be placed on a skeiner at any given time, and that the skein should be well shaken out before being placed on the machine. The skein should not be twisted when it is placed on the skeiners.

In bobbin winding, the winders should tie small knots. Large knots tend to make holes in the material. In most workshops, we understand, the 'weaver's knot' is tied. We strongly recommend that all bobbin winders be instructed to tie a reef knot, since it is both smaller and easier to tie than a weaver's knot.

Another important factor in good knitting is that the wool should be waxed. In all the machines on which winding is performed, arrangements are made for wax to be placed in slots, so that the wool is waxed during winding. One workshop has discovered that white oil is an effective substitute.

Too much wool should never be wound on to bobbins. We recommend the use of twelve-inch bobbins for blind workshops. Not more than one pound of material should be wound on them: larger quantities tend to make the bobbin 'soft-nosed', and this has a definite deleterious effect when knitting on the machines.

To assist indetermining the actual amount of material used for any garment, we recommend that the weight of each bobbin (empty) be marked on its base. This facilitates the obtaining of records for costing purposes.

iii. Prevention of waste of light coloured wools. Some of the dust and dirt of a factory tends to settle on the bobbins containing material, whether these bobbins are in actual use or in good storage cupboards. This dust, and also the handling of the bobbins, discolours the light-coloured wools. Consequently, quantities of discoloured wool are frequently unwrapped and thrown away as waste. We recommend that closely fitting paper caps be placed over bobbins containing light coloured wools.

2. Knitting.

Knitting is performed on two types of machines - flat machines and round machines. Garments such as suits, jumpers and cardigans etc. are knitted on the flat machines: only hosiery is knitted on the round machines.

i,. Flat machines.The commonest types of flat machines are the Harrison, the Dubied, and the Foster. They are all manipulated in the same way. The machines are obtained in various gauges - from seven needles to the inch (known as 7-gauge) to twelve needles to the inch (12-gauge). The demand for fine work appears to be increasing, so that greater attention should be paid to the 10- and 12- gauge machines. On some of the machines, every tenth needle is numbered in braille. Quicker calculations can be made by the operator in counting the number of needles etc. when braille numbering is used. We therefore recommend that braille numbers be placed on all machines.

(a) Cleaning of machines. Dust accumulates on these machines and eventually settles under the bed of the needles. To facilitate easy manipulation of the carriage, the machines need to be frequently and thoroughly cleaned. They are usually cleaned by hand. The time required to clean one thoroughly is approximately four hours. Some workshops experience a difficulty in sparing machines for this length of time, and they are therefore cleaned, in some cases, only once in six months or even once a year. A Sturtevant vacuum cleaner will keep a machine thoroughly clean, the cleaning requiring only about fifteen minutes. We recommend that such cleaners should be purchased and used every three weeks. This would greatly facilitate production.

(b) Supervision. During the process of knitting, the blind girls require continual attention: stitches which they have dropped need picking in, broken wool must be retied, and so on. In one workshop, sighted 'pickers-in' were employed to assist the blind workers to maintain continuous production. As soon as a machine-hand was in difficulties, a 'picker-in' gave her immediate attention. After some experiments, it was found that one 'picker-in' could keep twelve machine-hands continuously employed. This figure cannot be accepted too rigidly - the number of machine-hands to whom the 'picker-in' can attend must vary with the efficiency of the workers. The number of workers to a 'picker-in' will fluctuate between ten to fifteen.

The duties of the 'picker-in' will be entirely connected with the difficulties the operator experiences with the machine. A sighted charge hand, however, should remain with each section of workers, and she should be entirely responsible for the preparation of the garment - its design, length, width, etc. Considerable waste of time, labour, and material is known to occur at the machine. The charge hand should therefore maintain a continuous inspection of the work being performed by her section of workers to ensure that the correct patterns and designs are made, and that all errors are detected soon after they are made.

(c) Material wasted by operators. In all industrial processes losses occur due to faulty work, personal errors etc., but this loss is even greater in a blind factory than in a sighted one, and the management have more difficulty in minimising this loss. In one workshop, we discovered that this loss was nine per cent. We consider that this is excessive.

Waste of material is generally an indication of some inefficiency on the part of the operator. Some operators are not quite confident of themselves when working on certain models or garments. The question of reducing waste must therefore lie with the charge hands. To assist them to determine when this waste is becoming excessive, we recommend that a card should accompany the material as it progresses through the factory. This card (a specimen is given in Appendix VI) should bear a note of the quantity of material issued. When the machine operator has finished, the quantity of material returned to the stores etc. can then be noted. At this stage the garment should be weighed and its weight noted on this card. The figures will then inform the charge hands of those operators who are responsible for excessive wastes. Greater attention should then be paid to these workers until the waste has been considerably reduced. In this manner, not only would the waste of raw material be minimised, but production would increase owing to more efficient methods of working. Any waste beyond half an ounce per pound (approximately 3.1 per cent.) should be investigated by the charge hands, and those workers responsible for such waste should be carefully supervised and taught more efficient methods.

(d) Shaping of garments. In all but one of the workshops visited, garments are shaped by cutting, so that some portions of the garments have to be made a little longer in order to permit the cutter to shape them. Where garments are shaped on the machine, the process of knitting requires a longer period and more careful supervision.

(e) Reduction of waste on lengths of garments knitted. All garments are made to definite measurements. The stock models are made to standard lengths, while private orders always have the required measurements recorded. Since, however, the garment is kept very taut by means of weights while being knitted on the machine, there is a certain amount of shrinkage when the garment is taken off the machine. The charge hands make an allowance for this shrinkage by arranging for the garment to be knitted longer than the specified dimensions. The allowance made, however, is occasionally very excessive. In one workshop, an unnecessary waste of material of 7.57 per cent. was observed. There is need, therefore, for the issuing of definite instructions on this point.

Excessive allowance for shrinkage is responsible for a definite loss in production. If the allowances were reduced to a minimum, the workers could utilise on actual production the time now spent on preparing superfluous material. To obtain this saving of material and the increase in production time, we strongly recommend that every effort should be made to obtain more accurate estimates of the material required for each garment made.

ii. Round machines. These machines are used for the preparation of hosiery.

In many workshops, operators wind their own wool. The knitting machines are idle during this period and the maximum output is not obtained. As the process of winding wool for round machines is identical with that for flat machines: there is no necessity to have a different sized bobbin for these machines, and we strongly recommend that the Bobbin Winding Section wind the wool for the round machine operators.

The machines are usually of the Harrison pattern. A device has now been placed on the market which automatically raises or lowers the needles when the heel and to~~y~~e are being worked. The operator simply continues to turn the handle as in the main part of the stocking. A considerable increase in output is possible if this device is used. In addition, there is a special attachment which enables the machine to manufacture fancy knitted hosiery in two colours.

When the hose are prepared on these machines they are sent to the Finishing Section for pressing.

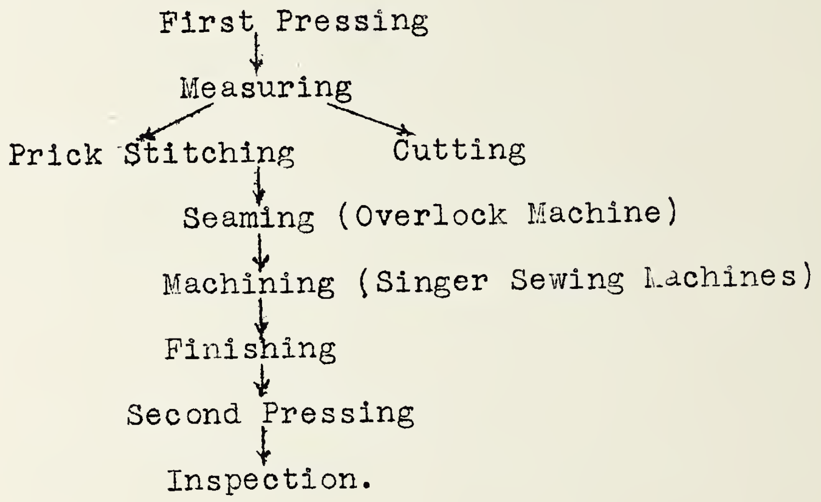
iii. Allocation of workers to machines. We are not in agreement with the practice of many workshops of transferring the girls from machine to machine. We strongly recommend that each girl be given a definite machine to work upon. This permits each worker to take a pride in her machine and it encourages her to look after it much more than she would if she were being constantly changed from one machine to another.

iv. Artificial illumination. It is necessary to have good local lighting for the purpose of assisting charge-hands and 'pickers-in' in examining the work in detail on the machines. Sufficient attention is not given this point in workshops: the managements usually take precaution to ensure good general lighting conditions, but overlook the need for local lighting. We recommend that 100-watt frosted bulbs with local intense reflectors should be used for this purpose, and that these bulbs should be suspended from a rod or bar overhead. The plugs attached to the leads should be permanently inserted, but the switching on and off the light should be performed at the bulb by a 'push' contact. The light should hang 3 feet 6 inches above the machine. This will permit it to pass above the accessories of the machines, and yet it will completely illuminate all the needles.

3. Finishing Section.

The material and its card should be received together in the Finishing Section. At this stage, the card contains the amount of material used, and the weight of the material after it has been knitted. The material for garments arrives in this section in varying numbers of pieces. The number of pieces should therefore be noted by the charge hands of the knitters on the back of the top right hand corner of the card for checking purposes.

The garments should then go through a sequence of processes as shown below.



i. Importance of first pressing. Some workshops do not send the garments through each of the above processes, but we urge consideration of the importance of the first stage.- first pressing. If garments are pressed immediately they arrive in this section, there is a definite facilitation of handling in the subsequent processes. This encourages workers and the time spent on first pressing is amply repaid.

ii. Safety and economy in use of electric iron. In all processes involving ironing, we recommend the installation of a red bulb for each iron, so arranged that a bulb is lit whenever the current for its particular iron has been switched on. Such an indicator tends to prevent the operators from wasting current, and it reduces the possibilities of a fire.

iii. Method of dealing with orders. Despite the fact that the orders go through a definite sequence of processes, in actual practice we find that the orders are broken up, so that several workers on the same process may be attending to garments of the same order. This method involves 'chasing' of the various garments to collect the whole order, and is liable to cause the mislaying of small portions of the order. We recommend that every worker should attend to each order in its entirety, whether it is a one-, two- or three-piece garment.

iv. Records of output. The organisation of such a department as the Finishing Section should not be difficult, since the processes are in sequence except at one stage. The output of each individual in this section should be recorded. We recommend for purposes of rough comparison, that a piece be taken as the unit of output. A jumper, coat, skirt or cardigan should each count as a unit. A one-piece garment should be counted as one garment, a two-piece garment should be counted as two garments, and so on. In this manner, standards of output can be made. Once the output has been obtained in any workshop, for at least a fortnight, more accurate methods of balancing the various processes could be made in future work. Still finer adjustments could be made if it were discovered that the number of girls employed on a process was identical or in a definite ratio to the number employed on the process immediately preceding it. Then arrangements could be made for one particular girl on one process to 'feed' a particular girl on the successive process with material and so on. This method would have the advantage of making it easy to trace which particular operator on any process worked on any definite order. Alternatively, the names of the workers could be entered on the cards accompanying garments. We recommend that every effort be made to obtain a systematic balancing of these processes in workshops.

v. Loss of garments. Losses are known to occur in this section. They are usually small 'oddments' of the garments such as pockets, collars, belts, etc., and the knitting section is usually blamed for their loss. Since fresh issues have to be made and the article lost has to be re-knitted, such losses are responsible for failure to supply some of the orders on the dates promised, as well as for the loss of material and time spent on the garment. In view of the new procedure previously recommended (that the accompanying card should have the number of pieces noted on it), we recommend that the operator on each process should make a check when beginning fresh work. If an operator drew the attention of the charge hand to a shortage, the operator on the previous process should then be held responsible for the loss, and appropriate action should be taken. In this manner, a complete check of the pieces throughout this section would be ensured, and there should be no further losses of parts of garments, and no further delays in the completion of orders.

4. Costing.

The card - commonly known as a 'job' card - which has been accompanying the material throughout the processes of knitting has adequate information on it to assist the Accounts Department in obtaining the actual cost of preparing garments. Consequently, we recommend that these cards be sent to the Accounts Department immediately the garment has been prepared. The selling price of garments made in the workshop can then be fixed.

(Signed) G. H. Miles.
Director.

February 3rd, 1931.

APPENDIX I.

NAMES OF BLIND WORKSHOPS VISITED.

1. Swiss Cottage, London.
2. Tottenham Court Road, London.
3. London Association for the Blind.
4. Blind Employment Factory, London.
5. Barclay Workshops for Blind Women, London.
6. Liverpool Workshops for the Blind.
7. Royal Birmingham Institute for the Blind.
8. Royal Midland Institution for the Blind, Nottingham.
9. Workshops of the Institution for the Blind, Leicester.
10. Henshaw's Institution for the Blind, Manchester.
11. Incorporated Institute for the Blind, Leeds.
12. Workshops of the Sheffield Corporation, Welfare of the Blind Department.

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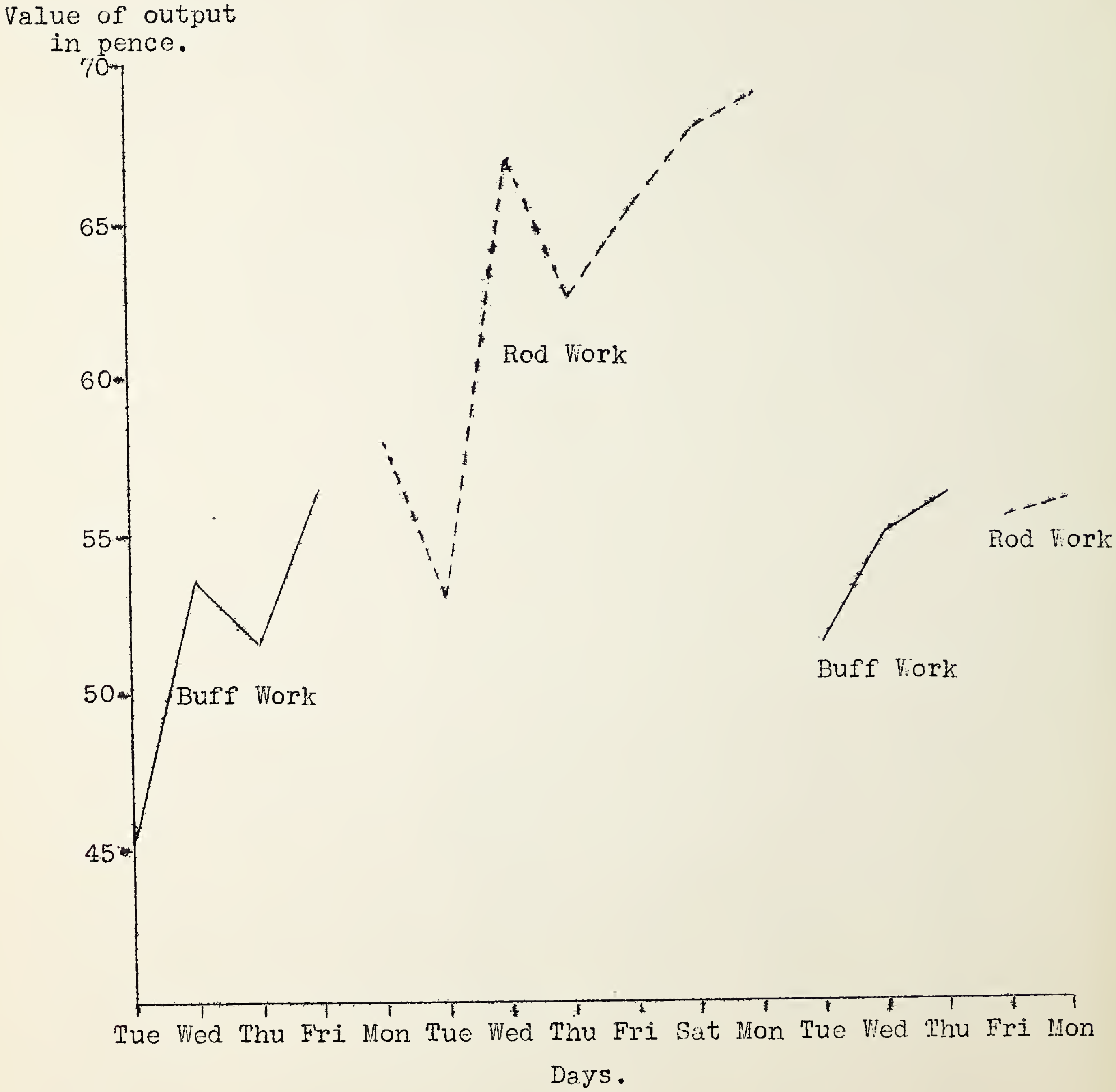
APPENDIX II.

OUTPUT CURVES.

Change from small difficult buff work to more straightforward rod work.



APPENDIX III.

BASKET TRADE.

Institution	No. of Workers and Average Wages.		No. of Hours Worked.	Method of Payment.	Augmentation	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work	No. of years training.
	Partially Blind.	Totally Blind.							
1	25/2 (13)	24/6 (10)	42½ hrs	London Union of Journeyman Basket Makers. (50% higher than list). Govt. contracts. special list. (37.5% higher than list.)	15/- pr head	4	5.5	General shop work	4 yrs.
2	39/- (10)	38/- (19)	47 "		15/- " "	5	7.8	" " "	4 yrs.min.
3	33/9 (26)	23/4 (16)	39 "		15/- " "	11	3.8	" " "	3 yrs.
4	28/5½ (40)	21/4 (21)	47 "		15/- " "	3	15.7	" " "	3 yrs.min.
6	32/- (27)		45 "	Lancs. & Cheshire Skip & Basket Makers Assoc.	16/6 p.w. for sq. intricate work. 10/- p.w. for rough work of ballast hampers.	3	9	Skips, square hampers & fenders	4 yrs.
7	23/2 (12)	25/10 (12)	48 "	Brit. Amal. Union of Basket Makers.	Varying from 6/2 - 22/6	2	12		5 yrs.
8	30/4 (7)	28/9 (6)	48 "	" " " "	5/- - 15/-	5		General square work	4 yrs
9	22/8 (4)	13/2 (10)	45¼ "	" " " "	18/3 - 22/-			General square work round work, fancy baskets & chairs	4 yrs
10	22/- (31)	20 (24)	45 "	Lancs & Cheshire Skip & Basket Makers Assoc.	20/- - 22/-	-	∞	Potatoe hampers, skips; genl. sq. work	3 yrs
11	25/10½ (3)	18/11 (17)	48 "	Yorks. Employers Cane & Willow Workers Assoc.	20/-	5	4	Skips, basket carriers office trays.	3 yrs
12	21/5 (5)	22/3 (9)	48 "	" " " "	12/4 - 20/-	2	7	Hampers, chairs, small fancy work	3 yrs

The numbers in brackets in Columns 2 and 3 are the numbers of workers from whose wages the average wage is calculated.

APPENDIX IV.

KNITTING TRADE.

Institution	No. of Workers and Average Wages.		No. of hours worked pr. week.	Method of Payment.	Augmentation.	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work.	No. of years training.
	Partially Blind.	Totally Blind.							
1	13/7 (15)	12/- (6)	37½ hrs.	Piece-rate fixed by Institution.	15/- per head	8	2.6	Cut for shaping	3 yrs.
3	22/5 (54)	19/5 (29)	44 "	"	15/- " "	53	1.6	" " "	2 yrs.
5	13/3½ (6)	17/3½ (6)	39 "	"	15/- " "	18	0.6	Shape on machine	3 yrs.
7	16/3 (9)	14/6 (9)	43½ "	"	Varies from 9/2 - 22/6	7	2.6	Cut for shaping	
8	15/2 (1)	22/5 (1)	42 "	"	5/- - 15/-	2	1.0	" " "	4 yrs knitting weaving & basketry.
9.	-	8/6 (3)	42¼ "	Natl. Hosiery Union	18/3 - 22/-	2	1.5	Round machines only.	
10.	Flat Machines.								
	12/10 (2)	13/9 (2)	40 "	Piece-rate fixed by Institution	20/- - 22/-	5	3.0	Cut for shaping	2 yrs minimum.
	Round Machines.								
	10/7 (10)	17/3 (1)		"					
11	10/8 (8)	7/7 (5)	44 "	"	20/- per head	2	6.5	" " "	3 yrs. minimum.

The numbers in brackets in Columns 2 and 3 are the number of workers from whose wages the average wage is calculated.

APPENDIX V.

WEAVING TRADE.

Institution	No. of Workers and Average W.		No. of hours. worked.	Method of Payment.	Augmentation	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work.	No. of years training
	Partially Blind	Totally Blind							
5	12/5½(24)	15/7(14)	39 hrs	Piece-rate fixed by Institution.	15/- per week.	7	5.4	Table decorations etc.	3 yrs.
8	12/2 (2)	-	42 "	" " "	5/- - 15/-	2	1.0	" " "	4 yrs. knitting weaving & basketry.
9.	-	14/5 (2)	42¼"	" " "	18/3 - 22/-	1	1.0	" " "	
10	Figures not obtained owing to workers not being continuously employed.		40 "	" " "	18/- - 19/6	1		Mattress tickings	2 yrs.
12			43 "	" " "	12/4 - 20/-				

The numbers in brackets in Columns 2 and 3 are the number of workers from whose wages the average wage is calculated.

APPENDIX VI.

JOB CARD.

DATE OF ORDER.	WORKS ORDER NO.	CUSTOMER'S NAME.	DATE DUE.

ARTICLE	MEASUREMENTS. (stereotyped print)	INCHES.
	(BUST	....
	WAIST	....
	HIPS	....
	ETC:)	

REMARKS.

APPENDIX VI (Contd.)

COSTING CARD.

(Reverse side of Job Card.)

COSTING

WINDING

DATE	ISSUED	RETURNED	USED	TIME	£		
					-	-	-

KNITTING

DATE	NAME	TIME			
			-	-	-

WEIGHT OF GARMENT lbs. ozs.

FINISHING (includes pressing).

DATE	NAME	TIME			
			-	-	-

LABOUR COSTS			
PLUS %			
TOTAL			
WEIGHT OF FINISHED GARMENT.			
LOSS IN PREPARING GARMENT.			
MATERIALS	-	-	-
	-	-	-
TOTAL COST			

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

Feb 192

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Report of Investigation

TO THE

NATIONAL INSTITUTE FOR THE BLIND

ON THE

BASKET, WEAVING AND KNITTING TRADES.

as conducted by

WORKSHOPS FOR THE BLIND.

Investigator: C.B.Fox.

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III. BASKET TRADE.(pp.6 - 13.)

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APPENDIX I.	NAMES OF BLIND WORKSHOPS VISITED.
APPENDIX II.	OUTPUT CURVES.
APPENDIX III.	DATA RE BASKET TRADE.
APPENDIX IV.	" " KNITTING TRADE.
APPENDIX V.	" " WEAVING TRADE.
APPENDIX VI.	JOB CARD & COSTING CARD.

I. INTRODUCTION.

The services of the National Institute of Industrial Psychology were engaged by the National Institute for the Blind for research into the problems of the employment of blind persons. For practical purposes, the field of research was divided into five main sections.

1. To examine blind workshop methods with regard to (a) management, (b) marketing.
2. To explore the possibilities of developing new industries in existing workshops for the blind, or in connection with them.
3. To explore the possibilities of developing new industries on a sub-contracting basis, either in existing workshops or in workshops for the blind planned for manufacturing articles or components used by manufacturers.
4. To discover operations or processes suitable for the blind in factories employing sighted labour.
5. To devise means of increasing the number of blind entrants into professions already known to be suitable, or into others not hitherto entered by the blind.

Problems concerned with Sections 3 and 4 are discussed in Bulletin No. 1 of the National Institute for the Blind. The present report deals with some aspects of the first problem. Although the two sub-sections - management and marketing - are closely related, each must be considered separately in this report. Only when the problems under each sub-section have been fully dealt with can the relationships of one sub-section to the other be considered. For this purpose, the problems of management only have been studied in the trades of basket making, knitting and weaving.

These trades have been studied in detail, and in order to determine whether local conditions necessitate modifications in the application of general principles, visits were made to various workshops for the blind enumerated in Appendix I. Facilities have been given without which this digest could not have been prepared. Accordingly, we wish to thank the management and staff of these workshops for their assistance and co-operation in the preparation of this report.

Throughout this report, we lay stress on methods of increasing production and on all economic factors governing mass production. The reason for this is to decrease the unit cost of production in order to obtain a market which is not available if production costs are high. The ultimate aim is to enable workshops to employ more blind persons.

Figures are furnished in Appendices III, IV and V, giving the number of workers employed in the trades under consideration, together with the wages earned, the augmentation paid to workers, and the type of articles produced. Noticeable features are that workers in the basket trade in general earn higher wages than in either the knitting or weaving industries and that the period of training for this trade is longer than for any of the others.

The methods adopted by institutions for paying augmentation to workers differ widely. This is due to the fact that the amount paid in augmentation is often dependent upon local conditions. Institutions Nos. 1 to 5 (Appendix I) are in the same town, and all workers receive the same augmentation. Some institutions which are near each other base their method of payment on sliding scales, and these scales differ widely from one institution to the other.

An important feature in the Appendices III, IV and V is the number of blind workers employed in workshops to each sighted member of the staff of that trade. The larger the number of sighted staff employed in a workshop, the greater are the possibilities for assisting the blind workers, and consequently the greater is the likelihood of the wage earnings of the blind workers being increased. Although the ratio of sighted staff to the number of blind workers is given, a comparison of the figures of one institution with another cannot be made, since the conditions are not identical. The piece rates on which workers are paid, and the number of hours which are worked in a week differ considerably. Another point which must be considered in dealing with wages earned, but which cannot be treated statistically, is the effect on the output of workers when there are few orders received. In such a case, workers tend to slow-down, while workers in a workshop which is fortunate in receiving orders for many articles, complete these orders at their best rate of working. It is because of these varying factors that no direct comparisons can be made from the figures in the appendices.

II. SUITABILITY OF TRADES CONDUCTED BY THE BLIND.

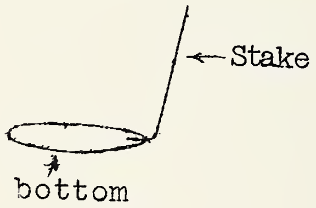
No definite experiments have yet been made to determine which of the trades conducted by the blind are the most suitable for them. In each of the trades mentioned in this report, there are processes which the blind find difficult to perform, while there are some which, it is recognised, should not be performed by the blind. Most of the difficulties of the former type of process are overcome by mechanical devices, while sighted persons are employed on the latter type. In this manner, trades which offer great difficulties for blind workers are now made possible for them. The present factors which determine the suitability of a trade for the blind are whether the blind are capable of earning a living wage in these trades, and whether such a trade can be maintained economically. Appendices III, IV and V contain the average wages of the workers in the various trades mentioned both for partially and for totally blind workers. The augmentation paid to workers is also given in these Appendices, together with the period of training necessary for each trade. This last information serves as a slight indication the difficulties experienced in teaching the various trades to blind workers. For example, the average period required for training workers in the basket industry is approximately 3.6 years, while weaving and knitting each requires 3 years. This seems to indicate that the basket industry offers greater difficulties to blind workers than either the knitting or weaving industries, and the period of training is accordingly longer. And yet the Eighth Report of the Advisory Committee on the Welfare of the Blind states that of the 9548 blind workers employed in England and Wales 1958 are employed as basket and cane workers, 1066 are employed as knitters, 725 are employed as mat makers, and 448 are employed as brush makers.

The figure for weavers, though small, was not mentioned. The above figures show that there are nearly twice as many basket workers as knitters, the next largest group. This gives further proof that the suitability of a trade is not dependent only upon the difficulties of its processes. In fact, the possibility of marketing the products is the main factor in determining the 'popularity' of any trade.

The whole future of the various trades depends very largely on the successful solution of the problem of marketing. We therefore studied local conditions which might affect this problem - such conditions as the position of the retail shop, the method of securing wholesale orders, etc., and we have recommended measures for increasing sales. But the whole problem of marketing must be examined in detail before the question of the suitability of each trade can be discussed at any length.

III. BASKET TRADE.

Baskets are generally prepared from canes and willows, which are first soaked in water-tanks to make them more pliable. They are then given to the basket-maker, who first prepares the bottom of the basket. The next process is known as the staking and upsetting. Great care must be taken here, for the correctness of shape of the basket depends entirely on the process of staking being well performed. One end of the stake is placed into the bottom of the basket. The stake is then bent upwards, the bend being made near the bottom. There may be as many as seventeen or eighteen stakes to a basket, and these determine the ultimate shape of the basket. Material is then woven round these stakes, and this is known as siding. The work of siding is simple once the staking has been performed correctly and securely. Above the siding is the border. On completion of the border, the basket is ready to be finished by fixing padlocks, bolts and rollers, and by 'picking', i.e. by cutting off all protruding ends.



1. General Lay-out.

Blind workers in the basket industry generally sit in two rows down the length of the room with their backs to the wall. Each worker is allocated a definite space for the preparation of his basket: the area varies from one institution to another. This space is known as the PITCH. Each pitch is marked out by partitions usually eight inches high, to prevent one worker from trespassing on the floor space of his neighbour.

The size of the pitch varies. In one workshop the allowance made is 8 feet by 7 feet 6 inches, while in others it is 11 feet by 9 feet. A worker certainly requires a larger area when he is preparing large hampers, skips etc. than when he is working on small fancy ware. But since workshops cannot guarantee their workers the same type of work continuously, arrangements have to be made to allocate sufficient space for the preparation of the largest type of basket that is produced. We are of opinion that a pitch nine feet square is ample for a basket maker preparing the ordinary sized hampers produced in workshops for the blind.

The workers sit on wooden 'planks', and at the head of each pitch, near the wall, is placed a wooden box containing the tools of the basket-maker. The raw material from which the worker prepares his basket is kept on either side of the 'plank'. Occasionally, workers sit on the box containing their implements in order to obtain a better 'purchase' - in order to use more force in preparing the basket.

Since workers generally sit in two rows facing each other, it is customary to have an aisle down the middle of the room to permit easy access to the pitches.

(i) Position of tanks. It is customary to place the soaking tanks within easy access of the workroom, so as to reduce the time required to reach them. For the same reason, the stores both of raw material and of the finished product, should be near the workroom.

(ii) Temperature of water in tanks. The water in these tanks sometimes freezes in the winter months, and the removal of material from them becomes a difficult and unpleasant task. It affects the individual who has extracted the material to the extent of preventing him from working for some considerable time - until his hands and fingers have lost their numbness. Moreover, the material becomes less pliable, and longer soaking is necessary in cold than in warm water. We therefore strongly recommend the warming of the water in the tank, particularly during the winter months.

(iii) Allocation of space in tanks. We also recommend that different parts of the tanks be specially allocated for the various types of raw materials used, so that the worker requiring fresh material from the tank knows exactly where to obtain it. He would then waste no time in searching amongst the material in the tank. We recommend that space be allocated for -

Cane Work.
- (a) Staking
- (b) Siding.
- (c) Finishing.

Rod Work.

Semi-Finished Work..

It is advisable that the tanks and the path leading to them should be placed under cover to protect the workers from inclement weather.

iv) Method of storage. The raw material in the stores should be so placed that every bundle of raw material should be accessible without interfering with any other bundles. In many institutions, bundles are placed crossways upon one another, so that it is often necessary to remove many bundles before the one required can be extracted. Much time and labour is thus wasted.

We recommend that the method of placing bundles in layers be continued, but that each layer be placed on a shelf. Any bundle can then be extracted without moving any other bundles. It is true that more accommodation will be required when these shelves are installed, but the extra space used will be small and will be more than compensated for by the saving of time and labour which would result.

2. Processes.

Raw material is first sorted on receipt of consignments in the workshop. Quantities are drawn from the stores as required.

In some institutions, one of the sighted staff is deputed to cut the stakes, while in others the workers cut their own stakes. The stakes are much thicker than the cane or willow used in the baskets. Should a stake be spoilt through bad cutting and shaping, a heavy waste of raw material results. When each worker cuts and prepares his own stakes, a large amount of waste is inevitable. Although this waste is considerably reduced when a sighted person cuts the stakes, it is yet uncertain whether this reduction compensates for his higher wages. It has not been possible to carry out experiments on this point, but some workshops employ a sighted man for this purpose. We are of the opinion that it would be economical to train a sighted youth to perform this and other duties.

The method of issuing the raw material to workers differs in various institutions. In some, the blind workers have to go to the stores to receive material from a sighted person responsible for its issue. In others, the raw material is brought to the pitches. The procedure for the soaking of material is somewhat similar: some institutions employ sighted persons, while in others the blind workers themselves soak the fresh material immediately on issue. We recommend that the sighted youth employed for cutting stakes, should be given these additional duties. This will permit the workers to remain at their work and will thereby increase the time available for actual manufacture.

Workers are paid on piece-rates usually fixed by the Board of Trade, and since these piece-rates have been determined only for the preparation of complete baskets and not of portions of baskets, it is customary in all blind institutions for each worker to start and complete his own basket.

i. Sub-division of labour. In practice, it is found that some workers are unable to prepare all the types of baskets produced in the department. If, therefore, orders are received only for these baskets which they cannot prepare, they have either no work to perform, or they must make baskets for stock, in the hope that there may be a demand for them later. But when the stock of such baskets is already considerable, the sole reason for increasing it is to keep such workers employed. And this may be definitely uneconomic. If, however, the manufacture of a basket were divided into four parts - the bottom, the staking and upsetting, the siding and the border - it might be found possible for these workers to construct one part only of the basket. In the preparation of a basket, once the staking and upsetting has been well performed, the next process, siding, is a simple one, and could be performed easily by those men who are unable to make a complete basket. If workers constructed one portion only of the basket, it would be possible to continue making those bsskets for which there is a specific demand, and yet to employ all the poorer workers. There would then be no necessity for the uneconomical policy of preparing baskets for stock to keep these poorer workers employed.

An experiment on this sub-division of labour was conducted in a workshop. Four men, who were all capable of preparing a barket individually, each prepared only one of the four parts of the basket. The material for the baskets was prepared for the workers. Since the men were not working alongside each other, each section of the basket which had been completed by one man was taken to the next worker. This transport of the parts could, of course, be greatly reduced in future team-work of a similar character. After making due allowances for the preparation of material and for any assistance in finishing, their output was 25.2 per cent. higher than when each completed his own basket.

The regularity of the flow of production was a very marked feature of the experiment and would greatly facilitate the delivery of orders ~~for~~ by a fixed date.

ii. Layout of raw material. Time is wasted by the blind workers in groping for their implements or for their raw material unless specific attention is paid to the positions to which these are allocated. In practice the worker places his raw material on both sides, and he often fumbles to find his next piece. As an experiment, a rack was designed to contain raw material. Since the material was placed in a definite position it could be easily withdrawn and consequently, the time available for actual work in production was increased. An increase in output of ten per cent. was obtained in this manner. We therefore recommend that suitably designed racks to hold raw material and tools be introduced into all workshops.

iii. Mechanical devices to assist in the preparation of baskets.

(a) Installation of 'Bodkins'. Workers sit on their 'planks' while preparing their baskets which are placed on 'lap boards'. Some workshops, however, have 'bodkins' firmly placed on these planks. Once the bottom of the basket has been prepared, and the staking and upsetting has been completed, the 'bodkin' is thrust through the bottom, so that the basket may swivel round it. Work is thereby facilitated, since both the worker's hands are free. We recommend that this method be adopted in all workshops.

(b) Installation of mechanical devices. In some institutions, workers use metal guides to assist them in preparing both square and round work. Every endeavour should be made to introduce in all workshops any mechanical device which assists either in the preparation of baskets, or in the preservation of their shape.

3. Supervision.

In some workshops, baskets are inspected by the sighted staff, and either passed or returned to the worker for correction. This method wastes time, labour, and sometimes material, since the errors are detected only when the basket has reached an advanced stage. In other workshops, however, the sighted staff maintain a continuous inspection of the work in progress. They detect the errors as soon as they are made, and so prevent the worker from continuing on an already incorrect basket. Considerable losses of time and labour are thus saved. In addition the sighted staff warn workers immediately difficulties appear, ~~and~~ instruct them how to overcome these difficulties, and so prevent the occurrence of errors.

Time is wasted in many workshops between the completion of one basket and the commencement of another, because the raw material has not been placed in the tanks early enough for it to have become thoroughly soaked and pliable. An effort is often made to prevent this waste by ~~the worker~~ using the material while still inadequately soaked. But in fact this is useless, for the working rate with unpliable material is much slower than with properly soaked material. With the method of continuous supervision it should be easy to arrange that the material is thoroughly soaked by the time it is required.

For these reasons, we strongly recommend that the method of continuous supervision be used in all workshops. The additional cost would in part be met by a higher output of better quality work. Moreover, the workers would be more contented when fully employed.

i. Variations in output due to change of work. Experiments were conducted in a workshop, where the workers were frequently changed from one type of work to another to determine what effect these frequent changes had on the output of the worker.

Certain workers made a definite type of basket for a few days, and they were then given a different type to prepare. After a few days, they again reverted to the earlier type of work, and then changed back to the later type. During the first period of work output increased. A change of work was introduced, and this, too, resulted in an increase in output. On reverting to the first type it was found that the worker's rate was higher than when he originally began, and that the production increased during this working period. A typical example is shown in the graph in Appendix II. The results indicate that there is here a field for further experiment, for which, however, we had no opportunity. In general, it is quite definite that seven days is not a sufficient time for attaining the maximum rate of work on a single type of basket. We therefore recommend that changes from one type to another should not be introduced until at least a week has passed. Should the changes be more frequent than this, the full efficiency of the worker is not utilised.

4. Finishing Section.

In many workshops, no definite room is allocated for the finishing of the baskets. In some, the blind workers are responsible for most of the finishing (i.e. picking, singeing of fancy baskets, etc.). In some workshops only a small area is allocated for the finishers to put on rollers, bolts, and the metal additions which make the basket complete. Such finishers are usually sighted persons. Workshops vary in their policy - some leave a great proportion of the finishing to these sighted persons in order to improve the appearance of the article to make it saleable, while others depend more upon the supervision of the blind workers while at their work so as to manufacture the article correctly from the initial stage. In the latter case, little or no finishing by sighted workers is required.

IV. WEAVING TRADE.

The trade of weaving can be sub-divided into three distinct processes.

1. The preparation of the warp, which is performed on a warping mill.
2. Weaving on looms.
3. Finishing the material woven into definite articles.

1. Warping Mill.

Material for weaving is first prepared on a Warping Mill, usually constructed in wood, circular or hexagonal in shape and from five to six feet in diameter. In its centre is a vertical spindle round which it revolves.

In order to prepare the warp, thread is wound round the mill. The thread first passes through a guide and then round the mill. As the mill revolves, the guide gradually descends. In this manner, threads of great length are wound round the mill, the length depending on the number of revolutions of the mill. The thread is then crossed over on pegs on the mill, and the mill revolves in the reverse direction (the guide ascending) until the same length has been wound round the mill as on the downward journey. The number of journeys (up and down) travelled by the mill depends on the desired width of the material. The narrowest width of cloth woven is usually eighteen inches. Since there are approximately twenty-two threads to the inch, material of eighteen inches width will require 396 journeys. To save time, many workshops use two threads at a time for preparing the warp. The time required when a single thread is used is nearly double that when two threads are used.

Device for increasing production by use of twelve threads. A device to be attached to the guide has been constructed, and is used in one of the institutions visited, for crossing the threads over the pegs on the mill. With it, twelve threads of the same colour can be used together, and output can be increased by at least eighty per cent. over that when two threads are used. The device is extremely cheap. We strongly recommend its utilisation on all warping mills.

ii. Indicator to assist totally blind workers. In all institutions visited where weaving is conducted, the warping mill is turned by hand, sometimes by a partially sighted and sometimes by a totally blind girl. From our observations, no difficulty was experienced by the partially-sighted workers who were able to see the thread. But with totally blind workers the speed varied considerably, the rate diminishing markedly towards the end of the journey, especially on the downward run. This great reduction of speed was due to the anxiety of the totally blind worker not to go beyond the requisite distance. In order to prevent this reduction of speed, we recommend that ~~our~~ an indicator - an adjustable bell, for example, - be attached to the slide on which the guide runs. This bell would notify the operator when she is just at the end of the journey. An indicator of a temporary character was devised in one workshop, and the workers found it of great assistance. With sighted or partially-sighted workers such an indicator is not required.

iii. Allocation of duties. It is customary for workers to prepare their own warps. This duty of warping is performed by each operator approximately once in twenty days. Since a warp requires, on an average, a day to prepare, the weavers have little time to acquire any marked skill. Immediately some slight skill is being developed, the weaver has completed the warp and returns to her main duty of weaving.

By the time she prepares her next warp, she has completely lost the skill she previously acquired, and her rate of production on the mill is consequently very low. We strongly recommend that one girl should prepare all warps. She will become very skilful at the work, and much less time will therefore be spent on it. If she is not continuously employed other duties may be given her. Pride in having a definite machine under her care and satisfaction in having a definite duty to perform will give added interest to her work.

In many workshops, it is considered desirable that the workers should know the various operations in their respective departments, and the weavers therefore prepare their own warps. We are of opinion that the policy is an extremely sound one, but, once each weaver knows how to prepare a warp, there is no necessity for her to continue doing so. Once the principle of the process is known and understood, there is no further reason for the worker to perform it, particularly when performing it means a reduction of the output of the mill. Moreover, while they are working at the mill, there is one loom more in the factory which is not in use. The loss therefore is a double one: the rate of output of the mill is low, and no output is obtained from the loom while the worker is preparing her warp.

When the warp is prepared, we recommend that the material should be wound round a drum direct from the mill, and then wound round the beam of the loom. We recommend that both processes, and particularly the latter should be preformed with the aid of a motor. The number of persons required would then be reduced. There are other methods employed in the workshops for 'beaming' the warp, but these have been introduced because of such difficulties as lack of equipment, shortage of floor space etc. Could these difficulties be overcome, we are convinced that the workshops will derive greater benefit by having all warps prepared by one worker and by having the beaming performed by motor. In one workshop where this arrangement has been adopted, the time required to beam a warp forty yards in length was about half an hour, although the warping mill was worked by hand. The time for the same length to be performed by hand only is about one or one-and-a-half hours.

2. Bobbin Winding Machines.

The instruments used for winding bobbins are usually of the Norwegian design, and are very simple in construction. They can be manipulated easily by the blind workers. Owing, however, to the very small diameter (2½ inches) of the wheel driving the screw spindle, there is an undue expenditure of energy with each turn of the handle (2⅗ inches radius). When new winders are purchased, we recommend that the wheels should be at least six inches in diameter, and that the machines should have automatic guides for the thread similar to the device fitted to sewing machines for winding bobbins.

i. Type of spool. The spool on which the cotton is wound for the process of weaving is made of paper, and skill is required to prepare it. During the process of weaving, delay is sometimes caused by the thread entangling in the shuttle and preventing it from passing across the warp. The shuttle has to be extracted from the warp and the loose thread unravelled and wound round the bobbin. Such difficulties arise when weaving material twenty-two inches or more wide - the broader the cloth the greater is the tendency for these difficulties to occur. We strongly recommend the use of wooden spools ready made, with raised edges on either side. The advantages of such a spool are as follows.

i. It is ready made and the time required to make a paper spool is eliminated.

ii. The edges of the spool prevent the thread from slipping off and becoming entangled with the warp.

iii. It is simpler to wind material on a spool of this shape since its edges act as guides.

iv. It will hold a far larger quantity of cotton than the paper spool usually prepared in the workshops, so that the woven garment contains fewer knots than one made with material on paper spools, and has therefore a much better appearance.

3. Weaving.

i. Throwing the shuttle. Weaving is performed by throwing the shuttle by hand on looms, most of which are of the Swedish pattern. If the shuttle is thrown incorrectly, it sticks between the layers of the warp, or falls through the warp to the ground. Workers take special precautions to prevent this: they steady the hand before releasing the shuttle to ensure that it will pass between the layers without mishap. This steadying occupies a very short period of time - on the average about one-fifth of a second - and it varies with different operators. With some, only this momentary steadying effect is noticeable. Others, however, make a distinct movement as if the shuttle were to be thrown in one clean sweeping action, but they then withdraw the hand a short distance, and after an instant's hesitation make the final throw. The average overall times taken by a group of workers to throw the shuttle are as follows.

(a) 1.6 seconds to throw a distance of 18 inches.
(b) 1.9 " " " " " 36 "
(c) 2.3 " " " " " 48 "

If the hesitation could be avoided, there would be a reduction in time for the respective widths of

(a) 0.2 seconds, corresponding to an increase in production of 14.3 per cent
(b) 0.2 " " " " " " " 11.8 "
(c) 0.2 " " " " " " " 9.5 "

The workers find it difficult to eradicate this superfluous movement. If, however, a ledge were placed on the banger under the threads, it would give the operators a sense of security in their throwing, and so enable them to dispense with their auxiliary movement. Such ledges are fitted to all looms using fly-shuttles.

ii. Use of feet. Looms are usually provided with three pairs of pedals (usually narrow strips of wood from one to one-and-a-half inches in width). The workers generally employ only one foot: some use the right, others the left, while a few change from one foot to the other when tired. The use of one foot only is extremely awkward and must be more tiring to the worker than the regular use of both feet. Moreover, in the initial stages of learning, an undue amount of time is occupied in finding the correct pedals. The use of both feet is a much more natural movement, and training is much more rapid if both are used. To permit the use of both feet, however, the looms require slight structural alterations. When one pedal - the right for example - is depressed, the left pedal rises. But the beam which receives and winds the completed work is so placed that the left knee comes into contact with the material and is prevented by it from ascending to the limit of its stroke. It is probably because of this obstruction that pupils have been taught to use only one foot. We recommend that the receiving beam be raised sufficiently to permit free movement of both knees, without interfering with the action of the 'banger' and that all weavers be trained to use both feet.

There is a considerable amount of side-play in the pedals, which often results in injury to the worker's ankles. To prevent this, we recommend that slots be provided in which the pedals can operate. This may tend to incrase output, but it will certainly free the operators from all fear of injuring their ankles.

Cord or string is generally used to connect the 'healds' to the particular pedals required, and time is wasted in untying and tying knots when a change of pedal is necessary. To avoid such delays we recommend that chains or leather 'thongs' and hooks be fitted to all looms for this purpose.

iii. Automatic 'take-up' and 'let-down'. In order to obtain more warp material, the weaver has to leave her seat and go to the back of the loom to release or 'let-down' the beam on which the warp threads are wound. She then 'takes-up' the completed material on another beam at the front of the loom. Time studies have revealed that the quantity of thread let-down permits the girl to work continuously for a maximum of about three minutes, after which the process has to be repeated. With slight structural alterations to the loom, this process of 'taking-up' and 'letting-down' could be performed automatically, as it is performed on the fly-shuttle loom.

In light repetitive work of this character, short working spells of two to three minutes do not permit the operator to develop a natural working rhythm. It has been suggested that the break after two or three minutes serves as a useful rest-pause, and reduces the effects of monotony. We agree that definite rest-pauses are essential in work of this character, but we do not consider that any advantage is gained when they are taken at such frequent intervals. We strongly recommend, therefore, that an automatic 'take-up' and 'let-down' be introduced. Such a mechanism would eliminate the frequent involuntary stoppages which at present occur, and would affect a very substantial reduction of unproductive time. The introduction of suitable rest-pauses could be considered on the basis of a careful scientific study of work curves.

iv. The fly shuttle loom: its advantages and disadvantages. The operation of the fly-shuttle loom differs from that of the Swedish loom in that the former is operated by pulling a string at the centre of the loom to send the shuttle through the warp, while the shuttle of the Swedish loom is thrown by hand. Pulling a string is an easier movement for a blind worker than throwing a shuttle. We are convinced that, with proper instruction, the advantages of a fly-shuttle loom over a hand-loom would soon be demonstrated, since

(a) the movements required to manipulate a fly-shuttle are much easier and quicker than those required to throw a hand-shuttle;

(b) the time necessary to teach the operators to pull the string is very much shorter than the time taken to teach them to throw the shuttle; and

(c) the output of the fly-shuttle loom is much greater than that of the Swedish loom.

We realise that a larger floor space is required by fly-shuttle looms. An extension of from fourteen to eighteen inches on both sides of the loom is necessary for the shuttle. This means that each fly-shuttle loom requires about three feet (in width) more floor space, but we are convinced that the increased output obtained from it will more than compensate for the additional floor space occupied by it.

In one workshop where a fly-shuttle loom was in operation, timings revealed an average of 20.4 seconds for ten throws against an average of 22.36 seconds on a hand-shuttle loom for the same width of material for the same number of throws . The day on which these timings were recorded was only the second day of the worker's experience of a fly-shuttle loom. A week later, however, timings were again taken, and these showed an average of 17.7 seconds for ten throws, or an increase of 26.3 per cent. on the output obtained from the hand-looms.

4. Finishing Section.

After the material is taken off the looms, it is inspected by the Finishing Section. Sighted workers are employed here, and they correct any small defects which have been made by the operator on the loom, and cut the cloth into the lengths required for articles being made.

All the weaving departments which were visited contained so few workers that the finishing of the material from the looms was performed sometimes by the finishers of the Knitting Department, and sometimes by the supervisors of the weavers themselves. Only in one institution were there any workers who were fully occupied in finishing: there were four finishers for thirty-eight weavers.

V. KNITTING TRADE.

This trade is divided into three distinct major processes.

1. Bobbin winding which consists of winding material such as wool, silk etc. on to bobbins.
2. Knitting the material on the machines.
3. Finishing. The material is taken off the machines, and cut and shaped. Collars, belts, buttons and pockets are sewn on to the garments.

1. Bobbin Winding.

It is important that every care should be taken to ensure that wool is well waxed and properly wound on to bobbins. This is essential in order to make the subsequent process of knitting a success.

Wool is frequently wound on to bobbins by hand, particularly in the smaller workshops. By this process not more than one bobbin can be wound at one time by an operator, and this obviously is much slower than the winding of several bobbins at the same time. There are two other methods in existence for winding bobbins - a triple machine winder and a six-spindle machine.

i. Triple machine winder. This hand-operated machine winds three spindles at the same time. Should, however, the wool break on one bobbin, the operator has to stop winding while attending to this bobbin. Similarly, she must stop while changing bobbins etc. At these times all three spindles are idle, and the efficiency of the machine is impaired. If it were mechanicallydriven, the operator could devote her whole time to ensuring that the winding was not interrupted.

Some workshops employ totally blind, some employ partially-blind, and some employ sighted persons for bobbin-winding. When using a machine having three or more spindles, it is necessary to have sight in order to ascertain if all the spindles are winding. With a worker who has little sight, it is difficult to know whether a spindle which continues to revolve is actually winding. Consequently, we recommend that no blind girls or workers with little sight should be employed on a machine winding three or more bobbins. To obtain the maximum efficiency from such machines, completely sighted persons should be employed. A sighted person, however, would not be fully occupied in attending three spindles, if the machine were mechanically driven.

ii. Six-spindle machine. Two types of workers - fully sighted and very slightly blind girls - have been observed in a workshop where mechanically driven six-spindle machines are used. The fully sighted workers produced better and more efficient work. Since three spindles cannot employ a sighted girl fully, we recommend the installation in workshops of mechanically driven six-spindle machines. Each girl should be given one machine to feed.

It is essential that not more than one skein of wool should be placed on a skeiner at any given time, and that the skein should be well shaken out before being placed on the machine. The skein should not be twisted when it is placed on the skeiners.

In bobbin winding, the winders should tie small knots. Large knots tend to make holes in the material. In most workshops, we understand, the 'weaver's knot' is tied. We strongly recommend that all bobbin winders be instructed to tie a reef knot, since it is both smaller and easier to tie than a weaver's knot.

Another important factor in good knitting is that the wool should be waxed. In all the machines on which winding is performed, arrangements are made for wax to be placed in slots, so that the wool is waxed during winding. One workshop has discovered that white oil is an effective substitute.

Too much wool should never be wound on to bobbins. We recommend the use of twelve-inch bobbins for blind workshops. Not more than one pound of material should be wound on them: larger quantities tend to make the bobbin 'soft-nosed', and this has a definite deleterious effect when knitting on the machines.

To assist indetermining the actual amount of material used for any garment, we recommend that the weight of each bobbin (empty) be marked on its base. This facilitates the obtaining of records for costing purposes.

iii. Prevention of waste of light coloured wools. Some of the dust and dirt of a factory tends to settle on the bobbins containing material, whether these bobbins are in actual use or in good storage cupboards. This dust, and also the handling of the bobbins, discolours the light-coloured wools. Consequently, quantities of discoloured wool are frequently unwrapped and thrown away as waste. We recommend that closely fitting paper caps be placed over bobbins containing light coloured wools.

2. Knitting.

Knitting is performed on two types of machines - flat machines and round machines. Garments such as suits, jumpers and cardigans etc. are knitted on the flat machines: only hosiery is knitted on the round machines.

i,. Flat machines. The commonest types of flat machines are the Harrison, the Dubied, and the Foster. They are all manipulated in the same way. The machines are obtained in various gauges - from seven needles to the inch (known as 7-gauge) to twelve needles to the inch (12-gauge). The demand for fine work appears to be increasing, so that greater attention should be paid to the 10- and 12- gauge machines. On some of the machines, every tenth needle is numbered in braille. Quicker calculations can be made by the operator in counting the number of needles etc. When braille numbering is used. We therefore recommend that braille numbers be placed on all machines.

(a) Cleaning of machines. Dust accumulates on these machines and eventually settles under the bed of the needles. To facilitate easy manipulation of the carriage, the machines need to be frequently and thoroughly cleaned. They are usually cleaned by hand. The time required to clean one thoroughly is approximately four hours. Some workshops experience a difficulty in sparing machines for this length of time, and they are therefore cleaned, in some cases, only once in six months or even once a year. A Sturtevant vacuum cleaner will keep a machine thoroughly clean, the cleaning requiring only about fifteen minutes. We recommend that such cleaners should be purchased and used every three weeks. This would greatly facilitate production.

(b) Supervision. During the process of knitting, the blind girls require continual attention: stitches which they have dropped need picking in, broken wool must be retied, and so on. In one workshop, sighted 'pickers-in' were employed to assist the blind workers to maintain continuous production. As soon as a machine-hand was in difficulties, a 'picker-in' gave her immediate attention. After some experiments, it was found that one 'picker-in' could keep twelve machine-hands continuously employed. This figure cannot be accepted too rigidly - the number of machine-hands to whom the 'picker-in' can attend must vary with the efficiency of the workers. The number of workers to a 'picker-in' will fluctuate between ten to fifteen.

The duties of the 'picker-in' will be entirely connected with the difficulties the operator experiences with the machine. A sighted charge hand, however, should remain with each section of workers, and she should be entirely responsible for the preparation of the garment - its design, length, width, etc. Considerable waste of time, labour, and material is known to occur at the machine. The charge hand should therefore maintain a continuous inspection of the work being performed by her section of workers to ensure that the correct patterns and designs are made, and that all errors are detected soon after they are made.

(c) Material wasted by operators. In all industrial processes losses occur due to faulty work, personal errors etc., but this loss is even greater in a blind factory than in a sighted one, and the management have more difficulty in minimising this loss. In one workshop, we discovered that this loss was nine per cent. We consider that this is excessive.

Waste of material is generally an indication of some inefficiency on the part of the operator. Some operators are not quite confident of themselves when working on certain models or garments. The question of reducing waste must therefore lie with the charge hands. To assist them to determine when this waste is becoming excessive, we recommend that a card should accompany the material as it progresses through the factory. This card (a specimen is given in Appendix VI) should bear a note of the quantity of material issued. When the machine operator has finished, the quantity of material returned to the stores etc. can then be noted. At this stage the garment should be weighed and its weight noted on this card. The figures will then inform the charge hands of those operators who are responsible for excessive wastes. Greater attention should then be paid to these workers until the waste has been considerably reduced. In this manner, not only would the waste of raw material be minimised, but production would increase owing to more efficient methods of working. Any waste beyond half an ounce per pound (approximately 3.1 per cent.) should be investigated by the charge hands, and those workers responsible for such waste should be carefully supervised and taught more efficient methods.

(d) Shaping of garments. In all but one of the workshops visited, garments are shaped by cutting, so that some portions of the garments have to be made a little longer in order to permit the cutter to shape them. Where garments are shaped on the machine, the process of knitting requires a longer period and more careful supervision.

(e) Reduction of waste on lengths of garments knitted. All garments are made to definite measurements. The stock models are made to standard lengths, while private orders always have the required measurements recorded. Since, however, the garment is kept very taut by means of weights while being knitted on the machine, there is a certain amount of shrinkage when the garment is taken off the machine. The charge hands make an allowance for this shrinkage by arranging for the garment to be knitted longer than the specified dimensions. The allowance made, however, is occasionally very excessive. In one workshop, an unnecessary waste of material of 7.57 per cent. was observed. There is need, therefore, for the issuing of definite instructions on this point.

Excessive allowance for shrinkage is responsible for a definite loss in production. If the allowances were reduced to a minimum, the workers could utilise on actual production the time now spent on preparing superfluous material. To obtain this saving of material and the increase in production time, we strongly recommend that every effort should be made to obtain more accurate estimates of the material required for each garment made.

ii. Round machines. These machines are used for the preparation of hosiery.

In many workshops, operators wind their own wool. The knitting machines are idle during this period and the maximum output is not obtained. As the process of winding wool for round machines is identical with that for flat machines: there is no necessity to have a different sized bobbin for these machines, and we strongly recommend that the Bobbin Winding Section wind the wool for the round machine operators.

The machines are usually of the Harrison pattern. A device has now been placed on the market which automatically raises or lowers the needles when the heel and to~~y~~e are being worked. The operator simply continues to turn the handle as in the main part of the stocking. A considerable increase in output is possible if this device is used. In addition, there is a special attachment which enables the machine to manufacture fancy knitted hosiery in two colours.

When the hose are prepared on these machines they are sent to the Finishing Section for pressing.

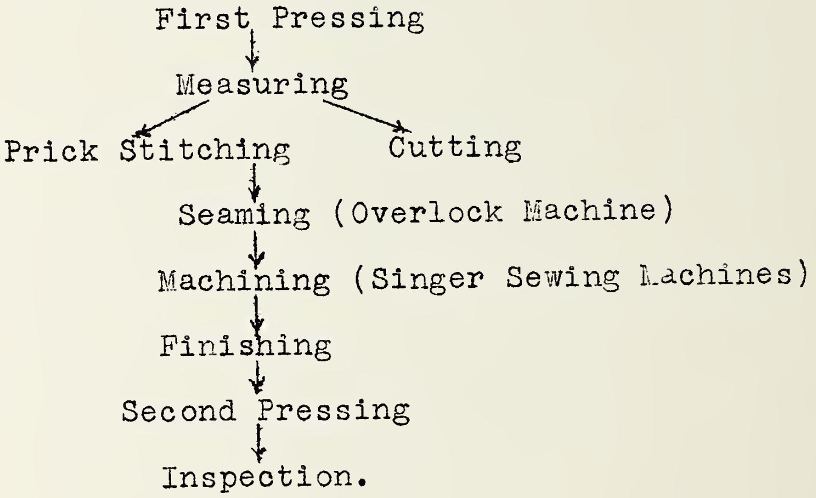
iii. Allocation of workers to machines. We are not in agreement with the practice of many workshops of transferring the girls from machine to machine. We strongly recommend that each girl be given a definite machine to work upon. This permits each worker to take a pride in her machine and it encourages her to look after it much more than she would if she were being constantly changed from one machine to another.

iv. Artificial illumination. It is necessary to have good local lighting for the purpose of assisting charge-hands and 'pickers-in' in examining the work in detail on the machines. Sufficient attention is not given this point in workshops: the managements usually take precaution to ensure good general lighting conditions, but overlook the need for local lighting. We recommend that 100-watt frosted bulbs with local intense reflectors should be used for this purpose, and that these bulbs should be suspended from a rod or bar overhead. The plugs attached to the leads should be permanently inserted, but the switching on and off of the light should be performed at the bulb by a 'push' contact. The light should hang 3 feet 6 inches above the machine. This will permit it to pass above the accessories of the machines, and yet it will completely illuminate all the needles.

3. Finishing Section.

The material and its card should be received together in the Finishing Section. At this stage, the card contains the amount of material used, and the weight of the material after it has been knitted. The material for garments arrives in this section in varying numbers of pieces. The number of pieces should therefore be noted by the charge hands of the knitters on the back of the top right hand corner of the card for checking purposes.

The garments should then go through a sequence of processes as shown below.



i. Importance of first pressing. Some workshops do not send the garments through each of the above processes, but we urge consideration of the importance of the first stage.- first pressing. If garments are pressed immediately they arrive in this section, there is a definite facilitation of handling in the subsequent processes. This encourages workers and the time spent on first pressing is amply repaid.

ii. Safety and economy in use of electric iron. In all processes involving ironing, we recommend the installation of a red bulb for each iron, so arranged that a bulb is lit whenever the current for its particular iron has been switched on. Such an indicator tends to prevent the operators from wasting current, and it reduces the possibilities of a fire.

iii. Method of dealing with orders. Despite the fact that the orders go through a definite sequence of processes, in actual practice we find that the orders are broken up, so that several workers on the same process may be attending to garments of the same order. This method involves 'chasing' of the various garments to collect the whole order, and is liable to cause the mislaying of small portions of the order. We recommend that every worker should attend to each order in its entirety, whether it is a one-, two-or three-piece garment.

iv. Records of output. The organisation of such a department as the Finishing Section should not be difficult, since the processes are in sequence except at one stage. The output of each individual in this section should be recorded. We recommend for purposes of rough comparison, that a piece be taken as the unit of output. A jumper, coat, skirt or cardigan should each count as a unit. A one-piece garment should be counted as one garment, a two-piece garment should be counted as two garments, and so on. In this manner, standards of output can be made. Once the output has been obtained in any workshop, for at least a fortnight, more accurate methods of balancing the various processes could be made in future work. Still finer adjustments could be made if it were discovered that the number of girls employed on a process was identical or in a definite ratio to the number employed on the process immediately preceding it. Then arrangements could be made for one particular girl on one process to 'feed' a particular girl on the successive process with material and so on. This method would have the advantage of making it easy to trace which particular operator on any process worked on any definite order. Alternatively, the names of the workers could be entered on the cards accompanying garments. We recommend that every effort be made to obtain a systematic balancing of these processes in workshops.

v. Loss of garments. Losses are known to occur in this section. They are usually small 'oddments' of the garments such as pockets, collars, belts, etc., and the knitting section is usually blamed for their loss. Since fresh issues have to be made and the article lost has to be re-knitted, such losses are responsible for failure to supply some of the orders on the dates promised, as well as for the loss of material and time spent on the garment. In view of the new procedure previously recommended (that the accompanying card should have the number of pieces noted on it), we recommend that the operator on each process should make a check when beginning fresh work. If an operator drew the attention of the charge hand to a shortage, the operator on the previous process should then be held responsible for the loss, and appropriate action should be taken. In this manner, a complete check of the pieces throughout this section would be ensured, and there should be no further losses of parts of garments, and no further delays in the completion of orders.

4. Costing.

The card - commonly known as a 'job' card - which has been accompanying the material throughout the processes of knitting has adequate information on it to assist the Accounts Department in obtaining the actual cost of preparing garments. Consequently, we recommend that these cards be sent to the Accounts Department immediately the garment has been prepared. The selling price of garments made in the workshop can then be fixed.

(Signed) G. H. Miles.
Director.

February 3rd, 1931.

APPENDIX I.

NAMES OF BLIND WORKSHOPS VISITED.

1. Swiss Cottage, London.
2. Tottenham Court Road, London.
3. London Association for the Blind.
4. Blind Employment Factory, London.
5. Barclay Workshops for Blind Women, London.
6. Liverpool Workshops for the Blind.
7. Royal Birmingham Institute for the Blind.
8. Royal Midland Institution for the Blind, Nottingham.
9. Workshops of the Institution for the Blind, Leicester.
10. Henshaw's Institution for the Blind, Manchester.
11. Incorporated Institute for the Blind, Leeds.
12. Workshops of the Sheffield Corporation, Welfare of the Blind Department.

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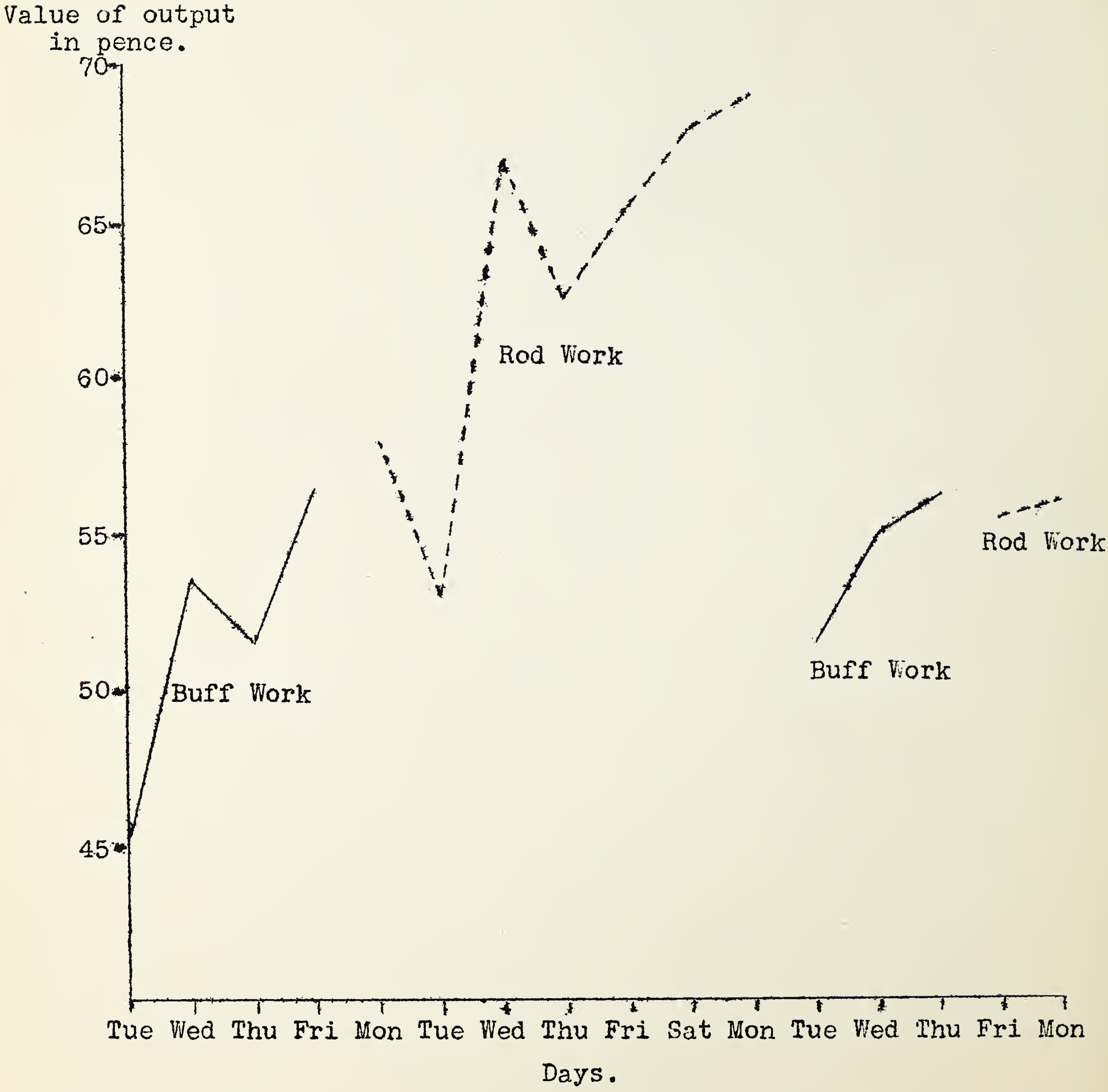
APPENDIX II.

OUTPUT CURVES.

Change from small difficult buff work to more straightforward rod work.



APPENDIX III.

BASKET TRADE.

Institution	No. of Workers and Average Wages.		No. of Hours Worked.	Method of Payment.	Augmentation	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work	No. of years training.
	Partially Blind.	Totally Blind.							
1	25/2 (18)	24/6 (10)	42½ hrs	London Union of Journeyman Basket Makers. (50% higher than list). Govt. contracts. special list. (37.5% higher than list.)	15/- pr head	4	5.5	General shop work	4 yrs.
2	39/- (10)	38/- (19)	47 "		15/- " "	5	7.8	" " "	4 yrs. min.
3	33/9 (26)	23/4 (16)	39 "		15/- " "	11	3.8	" " "	3 yrs.
4	28/5½ (40)	21/4 (21)	47 "		15/- " "	3	15.7	" " "	3 yrs. min.
6	32/- (27)		45 "	Lancs. & Cheshire Skip & Basket Makers Assoc.	16/6 p.w. for sq. intricate work. 10/- p.w. for rough work of ballast hampers.	3	9	Skips, square hampers & fenders	4 yrs.
7	23/2 (12)	25/10 (12)	48 "	Brit. Amal. Union of Basket Makers.	Varying from 6/2 - 22/6	2	12		5 yrs.
8	30/4 (7)	28/9 (6)	48 "	" " " "	5/- - 15/-	5		General square work	4 yrs
9	22/8 (4)	13/2 (10)	45¼ "	" " " "	18/3 - 22/-			General square work round work, fancy baskets & chairs	4 yrs
10	22/- (31)	20 (24)	45 "	Lancs. & Cheshire Skip & Basket Makers Assoc.	20/- - 22/-	-	∞	Potatoe hampers, skips; genl. sq. work	3 yrs
11	25/10½ (3)	18/11 (17)	48 "	Yorks. Employers Cane & Willow Workers Assoc	20/-	5	4	Skips, basket carriers office trays.	3 yrs
12	21/5 (5)	22/3 (9)	48 "	" " " "	12/4 - 20/-	2	7	Hampers, chairs, small fancy work	3 yrs

The numbers in brackets in Columns 2 and 3 are the numbers of workers from whose wages the average wage is calculated.

APPENDIX IV.

KNITTING TRADE.

Institution	No. of Workers and Average Wages. Partially Blind.	No. of Workers and Average Wages. Totally Blind.	No. of hours worked pr. week.	Method of Payment.	Augmentation.	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work.	No. of years training.
1	13/7 (15)	12/- (6)	37½ hrs.	Piece-rate fixed by Institution.	15/- per head	8	2.6	Cut for shaping	3 yrs.
3	22/5 (54)	19/5 (29)	44 "	"	15/- " "	53	1.6	" " "	2 yrs.
5	13/3½ (6)	17/3½ (6)	39 "	"	15/- " "	18	0.6	Shape on machine	3 yrs.
7	16/8 (9)	14/6 (9)	43½ "	"	Varies from 9/2 - 22/6	7	2.6	Cut for shaping	
8	15/2 (1)	22/5 (1)	42 "	"	5/- - 15/-	2	1.0	" " "	4 yrs. knitting weaving & basketry.
9.	-	8/6 (3)	42¼ "	Natl. Hosiery Union	18/3 - 22/-	2	1.5	Round machines only.	
10. Flat Machines.	12/10 (2)	13/9 (2)	40 "	Piece-rate fixed by Institution	20/- - 22/-	5	3.0	Cut for shaping	2 yrs minimum.
Round Machines.	10/7 (10)	17/3 (1)		"					
11	10/8 (8)	7/7 (5)	44 "	"	20/- per head	2	6.5	" " "	3 yrs. minimum.

The numbers in brackets in Columns 2 and 3 are the number of workers from whose wages the average wage is calculated.

APPENDIX V.

WEAVING TRADE.

Institution	No. of Workers and Average W.		No. of hours. worked.	Method of Payment.	Augmentation	No. of sighted staff.	Ratio of one sighted staff to blind workers.	Type of Work.	No. of years training
	Partially Blind	Totally Blind							
5	12/5½(24)	15/7(14)	39 hrs	Piece-rate fixed by Institution.	15/- per week.	7	5.4	Table decorations etc.	3 yrs.
8	12/2 (2)	-	42 "	" " "	5/- - 15/-	2	1.0	" " "	4 yrs. knitting weaving & basketry.
9.	-	14/5 (2)	42¼"	" " "	18/3 - 22/-	1	1.0	" " "	
10	Figures not obtained owing to workers not being continuously employed.		40 "	" " "	18/- - 19/6	1		Mattress tickings	2 yrs.
12			43 "	" " "	12/4 - 20/-				

The numbers in brackets in Columns 2 and 3 are the number of workers from whose wages the average wage is calculated.

APPENDIX VI.

JOB CARD.

DATE OF ORDER.	WORKS ORDER NO.	CUSTOMER'S NAME.	DATE DUE.

		INCHES.
ARTICLE	MEASUREMENTS. (stereotyped print)	
	(BUST	....
	WAIST	....
	HIPS	....
	ETC:)	

REMARKS.

APPENDIX VI (Contd.)

COSTING CARD.

(Reverse side of Job Card.)

<table>
<tr><td colspan="8">COSTING</td></tr>
<tr><td colspan="5">WINDING</td><td>£</td><td></td><td></td></tr>
<tr><td>DATE</td><td>ISSUED</td><td>RETURNED</td><td>USED</td><td>TIME</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="5">KNITTING</td><td></td><td></td><td></td></tr>
<tr><td>DATE</td><td colspan="2">NAME</td><td colspan="2">TIME</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2"></td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="5">WEIGHT OF GARMENT lbs. ozs.
FINISHING (includes pressing).</td><td></td><td></td><td></td></tr>
<tr><td>DATE</td><td colspan="2">NAME</td><td colspan="2">TIME</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2"></td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="5">LABOUR COSTS
PLUS %</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">TOTAL
WEIGHT OF FINISHED GARMENT.
LOSS IN PREPARING GARMENT.
MATERIALS</td><td>-
-</td><td>-
-</td><td>-
-</td></tr>
<tr><td colspan="5">TOTAL COST</td><td></td><td></td><td></td></tr>
</table>

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

ALDWYCH HOUSE, ALDWYCH, W.C.2.
R314

FOLLOW-UP

Report of ~~Investigation~~

AT

THE LONDON ASSOCIATION FOR THE BLIND,

KNITTING FACTORY,

144A, WARWICK STREET, S.W.1.

Investigator: C. B. Fox.

Period: January 28th - February 14th, 1931.

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I. INTRODUCTION.

A follow-up of the investigation conducted early last year at the Knitting Factory of the London Association for the Blind, Warwick Street, S.W.1. was made to ascertain the effects of the recommendations contained in the report on that investigation. The various processes were re-examined, in case fresh policies had affected some of the methods employed in the factory.

II. BOBBIN WINDING DEPARTMENT.

During the course of the original investigation, arrangements were made for the following modifications in winding procedure.

i. The wool was made to revolve once round the waxing spindle, so that the tension on the skeiners would always be approximately the same, and would reduce the causes of fracture of the wool. This change ensured also that the yarn would be more adequately waxed.

ii. Instructions were issued to the winders to ensure that all skeiners should be well shaken out before being placed on the machines, and that there should be no twist on the yarn when it is placed on the skeiners.

iii. All the winders were instructed to tie reef knots instead of weaver's knots, and to cut the ends of the knots short in order to decrease, in every way, the possibility of injuring the material on the machine.

iv. Arrangements were made for winders to place some definite distinguishing marks on the backs of the docket-forms, so that should a report be received of poor winding on any bobbin, the fault can be traced to the winder concerned.

v. To prevent waste material from being thrown on the floor, bags were tied at convenient places on the machine, and the operators were instructed to throw the waste into these bags.

vi. A fresh cap was designed to fit the bobbin closely, to prevent dust etc.from settling on the material.

vii. Storage methods and accommodation were replanned to increase the capacity of the stores.

The effects of these changes were studied during the follow-up. The difficulties experienced by the bobbin winders in winding some of the yarn has been considerably reduced by the altered methods. The factory management has stated that the waxing of the wool has been greatly improved, and that the number of large knots in the yarn has been considerably reduced. The room in which the actual winding is performed now presents a very neat appearance, owing to the prevention of the accumulation of waste on the floor. No records are available, but the management are of opinion that the new design of caps for the bobbins had reduced the waste caused by the settling of dust on the material.

The alterations in storage methods and equipment have provided the department with adequate rack-space for all its requirements.

Most of the finer quality wool is received in cone form, owing to the great difficulties experienced in winding such wool from the hank on to bobbins on the bobbin-winding machines. The Association pay approximately 4d. per pound to receive the wool in cone form. In 1929, over 10,000 pounds of wool were received on cones, and this cost approximately £170. The demand for material of finer quality wool is increasing, and probably £200 ~~were~~ was paid last year for receiving the wool on cones. The machines in the department are at least twenty years old, and they would not be able to wind such wool from the hank within an economical time. Modern winding machines, with 6 spindles, cost approximately £50. We urge the management to consider the replacement of the old machines by a modern type, which will wind 2/40 wool from the hank. Care will have to be taken to ensure that the correct type of machine is purchased, since manufacturers are often prepared to offer any machine regardless of the time taken to wind the wool.

III. KNITTING WORKSHOP.

1. New Procedure.

The arrangement of the division of the workshop into compact sections, each having a charge-hand and a picker-in, is being strictly adhered to. The management state that they have felt the benefits from this alteration. Instructions are issued more explicitly, while the girls in each section are ensured of continuous attention from the charge-hand and the picker-in, since these two sighted assistants have only a small area to cover. Charge-hands now frequently detect errors immediately they have occurred, and are therefore able to prevent the finishing of garments which are already faulty.

2. Lengths of Garments Knitted.

Great attention has been paid to ensuring that garments are not knitted too long. . Every endeavour has been made to adhere strictly to the scale for the shrinkage of various types of wool as laid down in Appendix VI.of our report on the investigation. (Report.No.R.278.)

Records were taken for a few days during the follow-up for all models completed, and these gave the following results:-

Ultimate weight of garments.	Necessary waste due to cutting.		Avoidable Waste.
114 lbs. 1½ ozs.	12 lbs. 12¼ ozs.		4 lbs. 8½ ozs.
126 lbs. 13¾ ozs.		or	3.57 per cent

During the original investigation, when this question of waste was receiving attention in the factory, and when the charge-hands were attempting to reduce it, the waste was 7.57 per cent. Thus the percentage of waste is now less than half its previous value. A waste of 7.57 per cent. is equivalent to a loss of £499. 12. 5 a year on an expenditure of £6,600 on wool for garments. A waste of 3.57 is equivalent to a loss of

£235. 12. 5 a year. The use of the scale for allowing for shrinkage has thus effected a saving of £264 a year.

The time previously spent in preparing this excess material is now spent on actual production, so that the factory obtains a double benefit from the reduction of waste. We are, however, convinced that the ultimate limits of the reduction of waste have not yet been reached, and we recommend that the management continue to give the matter their attention.

3. Material wasted by machine operators.

During the investigation a loss of material was found to occur at the actual process of knitting the garment on the machine. The loss was estimated at 9.07 per cent. of the total amount of material knitted. Arrangements were therefore made for the charge-hands to weigh the garments immediately after they had been knitted, and to record the weight on the costing card. The loss could then be determined by the charge-hands, who would thus know which operators were responsible for excessive waste, and greater attention could be given to such operators. In this manner, not only should the waste of material be minimised, but production should increase owing to more efficient methods of working.

In the follow-up, 101 cases were taken at random from the costing cards, and a waste of 8.67 per cent. discovered - a decrease of 0.4 per cent. This decrease does not give a complete picture of the efforts of the charge-hands, since the cases taken include many new models - all of which are made on the finer gauge machines. Work on fresh models and on finer quality work involves greater care etc. than on older and more familiar models, and on coarser types of work. Hence, the decrease in waste - little though it is - is really a clear indication of the efforts of the department, and, of the zest of the charge-hands in particular, to minimise this loss.

Arrangements have also been made for recording the names of the workers in the pay book (kept by the Departmental Head) according to sections, so that it could be seen at a glance which sections of workers were improving and which were not. Enquiries, too, could be instituted on behalf of individual workers. The information so recorded would also give some indication of the relative efficiencies of the charge-hands.

4. General Procedure of Work.

The general procedure of work laid down in our report on the investigation is being adhered to. It has been found to be very satisfactory in practice. All consignments of receipts from the Bobbin Winding Department are checked immediately on receipt, while the number of baskets in use now appears adequate for the requirements.

No garment leaves the workshop without a record being made in the Issue Book. This gives a clear trace of the order as it passes through the various departments. The inspectors of the workshop are now recording the number of pieces to each order on the cost card. As expected, this has resulted in a very considerable reduction in the number of articles lost in the Finishing Room. No records were taken of the losses which occurred during the investigation, so that a comparison is impossible, but the workshop management, who naturally complain against such losses occurring in the subsequent department, state that the loss is now extremely small.

5. Raw Material for the Round Machines.

All material for the round machines for knitting hosiery is now wound for the operators, in order to permit them to use their machines continuously.

6. Waste placed in Bags on Machines.

It was recommended that small bags should be tied at accessible positions on the machines, so that waste should be placed in them instead of being thrown on the floor. The collection of waste in this manner will give the workshop a neater appearance, and will facilitate the collection of the waste for sale. All the machines have not yet been provided with bags, but it was hoped to do so shortly.

7. Cleaning of Machines.

The vacuum cleaner purchased for cleaning the knitting machines has not been used to any considerable extent. The management, however, have decided that a systematic method of cleaning all the machines once every three weeks shall be adopted. Since production is facilitated by a high standard of cleanliness in the machines, we recommend that the management give this matter their immediate attention.

8. Ventilation.

During the investigation, kata-thermometer readings were taken in varying positions in the workshop, and none of them gave a reading above 3. We therefore recommended that the management approach the Sturtevant Company with a view to installing extraction fans. This recommendation, we understand, is receiving consideration.

9. Artificial Illumination.

Four local reflectors were recommended to assist the pickers-in and charge-hands in examining the work in detail on the machines. The Secretary of the Association is giving his personal attention to the question of installing these reflectors.

IV. FINISHING WORKROOM.

1. Reduction of Losses.

Each worker at a definite process now attends, as we arranged, to each order in its entirety, whether it is a one-, two-, or three-piece garment. This, and the noting of the number of pieces on the cost-card, are responsible for a large reduction of losses of small portions of orders in this room.

Daily records of output of each individual are now taken, and this assists the management in determining which processes are not sufficiently staffed, and those which are over-staffed. From these individual records, the management are now considering the advisability of paying as many workers as possible by piece-rates.

2. Seaming.

The process of seaming was examined in detail, since it is considered one of the 'bottle-necks' of the workroom. The operation is to seam together knitted pieces in order to make the sleeve, the skirt, etc. Much of the time of the operator is taken in placing the pieces accurately one over the other before they are put into the machine to be sewn together. Timings of two separate operators showed that the machine was working for only 25.9 per cent. and 17.6 per cent. of the total time. The total time taken in each case was thirty minutes. Since this process is one of the 'bottle-necks' of this workroom, and in view of the results of the time-study, we recommend that every effort be made to increase the total time the seaming machines are in operation. We have arranged that, at a more favourable time, one girl - perhaps one of the junior seamers - shall act as a 'feeder' to one or two seamers, the actual number depending upon how fast she is capable of working. The 'feeder' will open the order (usually tied in a bundle) and place the pieces together, so that the actual seamer has only to pick up the pieces and seam them on the machine. All conveying of finished orders, etc. will be performed by the feeder. This system would greatly increase the time during which the machines are engaged on actual production.

3. Safety and Economy in Use of Electric Iron.

In both processes (first and second pressing) involving ironing, a 3-watt bulb has been installed as a pilot light for each iron, so that a bulb is lit whenever the current for its particular iron has been switched on. Such an indicator reduces waste of current, and reduces the risk of a fire.

4. Artificial Illumination.

All the lights recommended in our report on the investigation have been installed and the management are satisfied with the improved quality of the work which has resulted.

The building is to be cleaned this summer. We recommend that the ceiling, the south wall and the outside of the cubicles be painted white in order to improve lighting conditions.

V. PLANNING.

On our recommendation, a Planner has been appointed to maintain a regular flow of work throughout the factory. This has been greatly appreciated by all the departmental heads, while systematic planning has eliminated all chasing. The workshop in particular has felt a great relief from the strain and anxiety of attempting to comply with individual orders to delivery dates. The shop at Kensington, and the showroom at the factory now allow only from seven to ten days for an order to be completed, instead of the previous fourteen or more days. This 'speeding up' of the process in the factory, and the complying with orders to delivery dates will alone tend to increase the number of orders received by the Association.

The Planner has further assisted in determining more accurately the demand of raw material for the garments. We examined over fifty cases taken at random, and found that the Planner has issued instructions to wind 14.7 per cent. more wool than was required for the garments. During the original investigation, it was found that 25.37 per cent. of excess wool was wound. There is therefore a reduction of 10.67 in the percentage figures. Many of the cases considered are fresh models. Thus the Planner is grasping the essentials of her duty very creditably, and, in determining the demands for raw material more accurately, she is responsible for

i. a reduction in time lost in waiting for additional supplies when the original demand has been too small; and for

ii. a reduction of waste due to the accumulation of dirt on the excess material on bobbins. If soiled material is not detected at this state, it becomes the cause of subsequent rejections of garments on account of 'shady' material.

VI. SHOWROOM.

Although the switches for the lights in the showroom have been connected in pairs, as we recommended, the type of lighting fixture has not yet been altered. The Secretary of the Association, however, is going into this matter personally. We can only confirm our previous opinion, that in order to attract customers to the showroom every effort should be made to make the room attractive. Good lighting is one of the methods by which the appearance of the room can be distinctly improved, and though it is difficult to determine the actual increase in sales that will result, we are sure that it will more than compensate for the costs of the improvements.

VII. ACKNOWLEDGEMENTS.

In conclusion, we wish to express again our thanks to Captain G. Pollard, O.B.E., the Secretary, to Miss A. M. Burrow, the Factory Manager and to the entire staff for all the facilities afforded our investigator.

March 17th, 1931. (Signed) G. H. Miles.
Director.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY

ALDWYCH HOUSE, ALDWYCH, W.C.2.

R322

14

VISIT

Report of ~~Investigation~~

AT

RICHMOND NATIONAL INSTITUTE FOR THE INDUSTRIOUS BLIND.

41, UPPER O'CONNELL STREET,

DUBLIN.

Period: March 18th to 21st, 1931.

Investigator: C. B. Fox.

I. INTRODUCTION. (pp.1,2.)
  1. Lack of Training. (pp.1,2.)
  2. Need for Improved Lighting Conditions. (p.2.)
  3. Purchase of Raw Material. (p.2.)

II. BASKET DEPARTMENT. (pp.3-5.)
  1. General Methods of Work. (pp.3,4.)
  2. Artificial Illumination. (p.4.)
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III. BRUSH DEPARTMENT. (pp.6 - 8.)
  1. Bass Dressing. (p.6.)
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  3. Period of Training for Workers. (pp.7,8.)

IV. MATTRESS DEPARTMENT. (p.8.)

V. SALES. (p.9.)

APPENDIX. AVERAGE WAGES OF WORKERS IN THE BRUSH AND BASKET TRADES.

I. INTRODUCTION.

A visit was paid to the Richmond National Institute for the Industrious Blind, Dublin, in order to study the trades practiced there, and to suggest methods of facilitating production.

There are only three trades conducted at the Richmond Institute - the manufacture of baskets, bass brooms and mattresses. The basic principles on which these trades depend are fully appreciated, but it was felt that the question of training has been somewhat neglected. Lack of training is partly responsible for the low wages earned. The average wages earned in the basket and brush trades are shown in the Appendix: since the workers in the Mattress Department are paid on a time wage, this department has not been included in the Appendix. The wages of each worker are supplemented by a further 15/4 per week from grants. A 47-hour week is worked, and there are no rest-pauses, although workers take unofficial 'breaks' from time to time. In many of the blind workshops in England, the introduction of rest-pauses of approximately fifteen minutes in both morning and afternoon sessions has proved beneficial, and their introduction here would be equally beneficial both to the workers and to the Institution.

1. Lack of Training.

Very little attention is paid to the training of workers in the various trades here, since the Institution is unable to afford instructors. But we are of opinion that the training of workers in any trade is of primary importance. The correct methods must be taught the workers until these methods of work have become habits. The use of good working methods is essential for efficiency and for the production of work of high quality. Poor work, which is often due to lack of training, is prejudicial to the cause of the blind, and tends to prevent response to appeals for them.

Moreover, there are two further reasons for careful training. Many of the workers are engaged as middle-aged men with no previous experience of industrial work. And the general level of intelligence seems to be somewhat lower than the average in blind institutions.

2. Need for Improved Lighting Conditions.

The lighting was noticeably poor. The workrooms were badly lit by gas, and it was necessary to use a torch in order to see the steps on the staircase. Blind workers react to good lighting conditions as much as sighted workers; while adequate illumination is essential for the partially-sighted and sighted employees. We therefore recommend that the present gas-lighting system be replaced by an adequate electric system.

3. Purchase of Raw Material.

Considerable economies are possible in the purchase of raw materials, some of which are supplied by retailers. If they cannot be obtained by the institution from wholesalers, it would probably be possible to arrange for some other Institution (e.g. Liverpool) to buy for them.

The Institution is going through a very difficult financial period, and though most of the general points requiring improvement are known to the management, they are prevented from introducing reforms by lack of funds. If the appointment of an Appeals Organiser results in the expected improvement in the financial conditions, we recommend that primary consideration be given to the need for better training and for improved illumination.

II. BASKET DEPARTMENT.

1. General Methods of Work.

Two long rooms, one immediately above the other, are allocated to the basket workers. Each room is approximately thirty-five yards long and seven yards broad. The floors are of wood. Hampers, potato baskets, general square and round work and chairs are made.

As in all basket workshops for the blind, the workers sit in two rows down the length of the rooms, with their backs to the wall. The 'pitch' of the worker is not marked out by partitions as it is in most English workshops. The workers sit on stools or boxes and prepare their baskets on lap-boards, on either side of which are placed their raw material and implements. Implements tend to get mixed with the raw material, and time is lost by the worker in groping for his implements. In English basket workshops, the journeyman sits on a wooden plank. The raw material is placed alongside this plank, while the implements are placed on it. Such definite allocations of material and implements prevent loss of time in searching for one or the other.

The workers cut their own stakes, fetch their material and 'pick' their baskets. The hides, padlocks etc. are added by two partially-sighted finishers. The foreman is partially-sighted.

There are three tanks: one is in the basement for heating brown willow, one on the ground floor, but in the open, and the third on the first floor for soaking willow, etc. The cane and willow is stored in the basement, in the charge of a totally blind man, who also sorts rods. The stores are extremely badly kept, material being strewn over the room. Much time is lost in finding raw material, while a considerable waste of material must occur. A good deal of time and material could be saved by engaging a sighted youth to look after the raw material, to store it methodically, and to issue it to the workers at their plinths. The present worker is paid 30/- weekly. A sighted youth - even if paid this wage - would be of considerably more value to this department.

All the workers are paid on a piece-rate fixed by the Amalgamated Union of Basket Makers of Great Britain and Ireland.

2 Artificial Illumination.

The walls of the rooms of this department are whitewashed, but there are only two gas lights in the room on the ground floor, and four in the room above. The lighting in both rooms is totally inadequate. It is not correct to suppose that since the workshop is for blind men, there is no need for good lighting, for it has been found that adequate illumination has a beneficial effect upon the work of totally blind and partially-sighted workers.

Moreover, it will be essential for the increased supervision which/we recommend for the department: the supervisor should visit the journeymen frequently to ensure the baskets are being made correctly. The need for such supervision, and the beneficial effects of good lighting for all blind workers justify our strongly recommending that an adequate illumination system be installed as soon as possible.

A careful examination showed that although the workers appreciated the basic principles of basket-making, the square work in general was not very regular in shape. To improve this, we recommend the use of frames or metallic guides to assist in maintaining the shapes, and to simplify the process of staking and upsetting. The appearance of the finished product would be greatly improved by the use of these guides.

We are of opinion that one cause of the irregular shape of the square work is the insufficient attention paid to the training of the journeymen.

3. Training of Workers.

Until about three years ago, it was customary for each recruit to be placed with a journeyman and to receive training from him. The success of this 'system' depended solely upon each individual. The majority of the journeymen now in the department have been trained under this 'system'. The present Superintendent has been responsible for placing the trainees under the care of the foreman. This is a move in the right direction, but since the foreman is an especially busy man - having nineteen journeymen and five trainees under his care - he cannot devote much attention to the trainees. Further, the trainees are at the end of the room remote from the foreman and the finishers. Since the management are unable to afford an instructor for the trainees, we recommend that the trainees should be placed in closer proximity to the foreman, so that he may easily watch their progress.

The period of training permitted now is five years.

4. Improved Implements to Assist Production.

Most of the screw-blocks in the department appeared to be old, and not sufficiently effective in holding the stakes. We recommend that these be replaced by more efficient ones.

We recommend, too, the use of 'bodkins'. Some English workshops for the blind have these bodkins firmly placed on the lap-boards. Once the bottom of the basket has been prepared, and the staking and upsetting has been completed, the bodkin is thrust through the bottom so that the basket may swivel round it. Work is thereby facilitated, since both the worker's hands are free. We strongly recommend the introduction of this device.

III. BRUSH DEPARTMENT.

Only bass work is prepared at pans in this department. The brushes made are usually of the scavenger type.

1. Bass Dressing.

This is the only workshop we have visited which employs two totally blind men for dressing the bass brooms. In one workshop in England, dressing was performed by sighted men on the premises, and was a distinct financial success. There, however, all types of brushes were made. It may well be quite within the scope of blind workers to make the process of dressing bass a financial success but no figures were available which would enable us to judge of its success in this case. The process was originally introduced to provide employment for the workers.

2. Pan Work.

There are two pans in this room, and therefore two tables, of which one is square and the other is pentagonal. The length of each side of the latter table (outer dimension) is thirty-four inches. The majority of the English workshops for the blind have square tables, though at one, six workers sat at a table. The pentagonal-shaped table is of great interest. Although only four workers were seated at this table, we are of opinion that there would be adequate room for five workers.

A totally blind worker is employed as a general handyman, and he supplies the pitch, whiting, and bass to the pan workers. Whiting is obtained in powder form, but we recommend that all future purchases should be made in lumps since this is a more economical way of buying it. Since there is no tariff on whiting, it may be purchased at a cheaper rate from England - as is the pitch. The foreman bores the holes in all the stocks, and is continuously employed as a worker in boring, trimming and inspecting. It may prove to be cheaper to purchase the stocks already bored.

The vapour of the pitch is extracted by overhead cowls, but the extraction is not satisfactory. The ducts, which are five inches in diameter, are too narrow to receive all the vapour from the pans. In one workshop in England where there are eleven pans in one room, the vapour is extracted very effectively through ducts ten inches in diameter. We recommend that the ducts here be enlarged, and that they be led directly out to the open. The 'pull' will then be quite sufficient to extract all the vapour. The walls, which were previously white, have been painted a dull red-brown because of the fumes which remain in the room. When the extraction has been made more effective, we recommend that the walls be again whitewashed, and that an improved system of lighting be installed.

3. Period of Training for Workers.

The basic methods of the pan workers here are the same as those used in all workshops for the blind, but here, again, we observed a slowness of movement. We are of opinion this is due to a total lack of training, since the foreman has no time available for the supervision of workers or for the training of new employees. The workers are paid on a piece-rate fixed by the Board of Trade. Although the average wages of a pan worker are given in the Appendix as 22/10 per week, the figure does not give a true picture of the position. One of these workers earns approximately 47/- per week: if he were excluded from the average, the wages of the remaining three workers would show an average of 15/7 per week - an extremely low figure.

No training period is allowed for this trade. A worker entered this department about three weeks back, and he is already preparing brushes for sale, and he is paid at the usual piece-rate. His average wage is approximately 10/- per week. We recommend that workers in this trade should receive definite training. They will then be able to employ better methods of work, and the quality of work will remain at a higher level. Without training, the quality of the work must be poor, and sales must thereby be lowered.

Poor quality products are prejudicial to the cause of the blind.

IV. MATTRESS DEPARTMENT.

The ten workers employed here are paid on a time wage.

The 'ticking' is purchased and marked out by the sighted departmental charge. The sewing of the cases for the mattresses is performed on contract by sighted workers. The cases are then filled, usually with hair, by the blind men. Great care is taken to ensure that the mattress is uniformly filled, and that a similar quantity (by weight) of filling is placed in each mattress. They are then sewn up except at the mouth - an aperture two feet wide - which is left open until the departmental charge has inspected the mattress to determine if any more filling is necessary. The 'mouth' is then sewn up.

There is a carding machine in the next room, which is used for breaking up the lumps of filling and for cleaning it. Here again, the 'pull' from the flue is insufficient to extract all the fluff etc. from the room. The method of extraction would be improved by increasing the diameter of the duct leading to the flue.

Four workers stitch the same mattress - one on each side of it. It may be found advantageous to place this work on a piece-rate basis fixed by the workshop, and to permit each worker to complete his own mattress.

V. SALES.

There is a shop in the front of the building with a window in which the products of the basket and brush departments are displayed. The window is not decoratively dressed, and there is nothing to attract the attention of the public. The Superintendent is of the opinion that the public are aware that there is a blind institution in the neighbourhood, and that work is performed by the blind there. But we think that the Institution should not be satisfied with so vague a realisation of its existence. The shop window should be attractively dressed, and furnished with a device in motion to attract attention. A large oscillating arrow has been found very effective by 'blind' shops in England.

There is no outside representative or salesman for the Institution. Most of the orders obtained are from the Government, and these are at such low prices that the Institution lose on most of these orders. The only reason for undertaking them is the provision of employment for the blind. Since Dublin is on the coast, every effort should be made to secure orders for brushes and mattresses from shipping companies. The articles manufactured should be displayed at fetes, bazaars, etc. We strongly recommend that no opportunity be missed of placing the products of the Institution before the public. This point is the most important and urgent of all those which require attention.

In conclusion we wish to express our thanks to Mr. C. H. Dickinson, the Secretary, and in particular to Mr. G. S. Coomber, M.C., the Superintendent, for all the facilities afforded our investigator.

April 17th, 1931. (Signed) G.H.Miles.
Director.

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APPENDIX.

AVERAGE WAGES OF WORKERS IN THE BRUSH AND BASKET TRADES.

Period: four weeks ending on March 13, 1931.

Brush Trade.

Average wage for four workers, 22/10 per week.

Basket Trade.

Average wage for eight workers, 17/1 per week.

NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY
ALDWYCH HOUSE, ALDWYCH, W.C.2.

R326

Report of Investigation

AT

THE KNITTING NEEDLE MACHINE SHOP, PECKHAM.

Period: From March 30 to April 2, and from April 20 to April 30, 1931.

Investigator: C. B. Fox.

I. GENERAL SUMMARY OF THE RESULTS OF THE EXPERIMENT. (pp.1,2.)

II. THE MACHINE SHOP. (pp.3-10.)

1. Trapping for Knobs and Stems. (pp.3,4.)
2. Cutting. (p.4.)
3. Turning on Capstan Lathes. (pp.4,5.)
4. Pointing. (pp.5,6.)
5. Assembling Process. (pp.6-8.)
    - i. Fix knobs and 'pimple'. (p.6.)
    - ii. Polish. (p.6.)
    - iii. Bundle. (pp.6-8.)
6. Method of Counting. (pp.8,9.)
7. Buying and Selling. (p.9.)
8. Dust. (pp.9,10.)

III. ACKNOWLEDGMENTS. (p.10.)

APPENDIX I. HISTORY OF WORKERS IN KNITTING NEEDLE MACHINE SHOP.

APPENDIX II. COMPARATIVE PRODUCTION OF CAPSTAN LATHES WITH RODS 13 AND 19½ INCHES LONG.

I. GENERAL SUMMARY OF THE RESULTS OF THE EXPERIMENT.

The Machine Shop at Peckham was established on June 10 1924 with four blind men as an experiment in employing those blind workers who were considered unfit for engagement in the trades usually conducted in workshops for the blind. Eleven blind workers are now employed: Appendix I contains the history of each of them. Before coming to this factory, six had been tried for some of the trades conducted by other workshops for the blind and had been rejected. Eight commenced to learn the trade when they were more than forty years old. And yet the majority of the workers earn wages which compare quite favourably with those earned by the blind in other trades.

The figures for the last three financial years show that the shop has not made a net profit.

In the year 1927-8 there was a gross loss of 20.28 per cent.on turnover.
" " " 1928-9 " " " gross profit " 2.73 " " " "
" " " 1929-30 " " " gross " " 23.93 " " " "

Financially, the experiment has not been completely successful. But it must be remembered that few, if any, of the workshops for the blind make a net profit: none of those which we have visited has done so. The shop is at least as successful as many of the workshops for the blind, in spite of the facts that its workers would elsewhere be considered 'unemployable', and that eight of them learned their work at an advanced age.

A further feature of the experiment is the small number of accidents which occur: only five were recorded during the past three years.

The experiment, therefore, has, on the whole, been very successful. It would become still more successful if more blind workers could be employed. There is every reason to suppose that the shop could extend its sales considerably if it desired to do so.

Although no sales representative is employed, orders are obtained for sufficient needles to keep the workers continuously employed. A capable salesman would be able to find new markets for the products of the factory.

Thus it would be possible to extend the work of the factory, although doing so would mean either that the present shop would need enlargement or that a new workshop would have to be found. Whether it is desirable to extend the work depends on the number of blind workers who are 'unemployable' in the other workshops for the blind. If there are sufficient such men, we strongly recommend extension to give them employment.

II. THE MACHINE SHOP.

The Machine Shop consists of one small room, from which the Departmental Manager's office has been partitioned.

The needles are made from casein material, which is purchased in rods. The process of manufacture consists of two distinct parts - the preparation of the stems, and the manufacture of the knobs on capstan lathes. Both parts are worked simultaneously. The steps in the manufacture of needles are as follows.

Preparation of Knobs.		Preparation of Stems.	
Process 1.	Trapping.	Process 1.	Tapping.
" 2.	Cutting.	" 2.	Cutting to lengths.
" 3.	Turning on Capstan Lathes.	" 3.	Pointing.

Assembly.

Process 1. Fix Knobs and Pimple.
" 2. Polish.
" 3. Bundle.

There are in all nine processes, though one man performs both trapping processes, and another man performs both cutting processes. The time available did not permit us to make time and movement studies, although there is ample scope for such work on all processes.

1. Trapping for Knobs and Stems.

Raw material is received in rods of definite lengths, but the manufacturers are unable to guarantee the diameter of the rods. Should rods of 10½ millimetres diameter be ordered, it is quite possible that rods 11½ millimeters in diameter may be received. The cost of the rods is determined by ~~this~~ their weight.

The rods are placed singly in the trapping machine and shaved off to the desired diameter. The operator feeds the machine by passing the rod through an aperture and he withdraws it from the other side of the machine. This operation requires much less time than most of the other operations in the shop. The machine is therefore operated by a man from any of the other processes which is in advance of the work of the rest of the shop. The work is paid on a piece-rate basis.

2. Cutting.

After trapping, all the rods for knobs and stems are cut into lengths by a guillotine.

For the preparation of knobs, the rods, which are usually from thirty-nine to forty-one inches long, are cut into halves. For stems, however, the rods are cut to the length desired for the needles. The work is paid on a time rate.

We recommend that the rods used for knobs should be cut into three pieces, two pieces of which should not be more than thirteen inches long. The reason for this recommendation is explained in the next section.

3. Turning on Capstan Lathes.

There are three lathes, similar in principle, in the shop, but the dimensions of one of them are not the same as those of the other two. Each lathe has its one regular operator who is paid on a piece-rate basis.

The rods are fed into a lathe from one end. If the rod is shorter than the length of stroke of the machine, the machine can be worked continuously; but if the rod is longer, the operator has to stop the machine after preparing a knob, push the rod by hand towards the working end of the lathe, and start the machine. This has to be performed for each knob until the length of rod is less than the length of stroke. The average time taken for preparing a knob when the rod is longer than the stroke is 20.8 seconds, whereas the average time required to prepare a knob when the rod is within the capacity of the machine is 10.3 seconds. Appendix II shows that if the length of rod for this lathe were thirteen inches, there would be an increase in output of 8.09 per cent.

The lengths of stroke of the machines are 25½, 17½ and 13 inches. Maximum production will be obtained if, as already recommended, two pieces not more than thirteen inches long are cut from the rods: these two pieces will be turned on the lathes with the shortest strokes. The length of the remaining piece will vary between thirteen and fifteen inches; it will be turned on the lathe with the longest stroke.

4. Pointing.

One man is continuously employed on this process, and his work is paid on a piece-rate basis. He takes a needle from a box and pushes it through an aperture until the end comes in contact with a grinding wheel. He then rotates the needle between his fingers until the wheel has ground the end of the needle to a point. The process is then finished, and he deposits the needle in a box placed eighteen to twenty-four inches away.

It seemed probable that the process would be quickened if the worker held several needles in his hand while pointing another one, since it would reduce the stretching necessary to reach the box in which the unpointed needles were kept. A further saving of time would result from the use of a chute from the lathe to the box in which the pointed needles were collected. We therefore arranged to try this new working method experimentally. Unfortunately, the worker, who is usually employed on this lathe, fell ill: in his absence, the experiment was tried with another worker. His average time for pointing a needle was 7.85 seconds, after three days' practice. The average time taken by the other worker, using the old method, was 11.93 seconds per needle - over four seconds longer than the time taken by his substitute with the new method. Obviously, this is no proof of the superiority of the new method, but it is an indication that the alterations made may effect very considerable savings of time. We therefore strongly recommend that the new method be given a further trial and, if the results are satisfactory, that the new method be adopted.

5. Assembling Process.

i. Fix knobs and 'pimple'. Two sighted girls are employed on this process and they are paid on a time rate.

'Pimpling' is performed by flattening the head of the knob (after it is fixed to the stem) against a grinding wheel. The knobs are sometimes dented by the capstan lathes, and it is the duty of the girls to remove the indentations.

Since this work is paid on a time-rate basis, output was not recorded. We have now introduced a system for recording the output of each process so that the management may realise the value of balancing the various processes, one with the other.

After 'pimpling', the needles are sent to the polishers.

ii. Polish. The needles are polished in the usual manner. There are five polishers and one pupil. The output of the journeymen is recorded since they are paid on a piece-rate basis. The output of one of them greatly exceeds that of any of the others, and this is due entirely to his ability. The ability of the others is comparable with that of the 'less employable blind'.

iii. Bundle. A sighted girl was employed at this process: she was paid on a time-rate basis. She first inspected the material, then collected the needles in pairs, and packed them in a slip of paper labelled "London Association for the Blind". She recorded her own output.

The system of having one girl both to inspect and to pack the finished needles involves the danger that the inspection may become lax if a batch of needles is required immediately to complete an order. For this reason a system of continuous inspection was introduced. A sighted girl collects needles at definite periods from each worker, inspects and counts them, and then passes them on to the next process. At the same time, a record is made in the worker's book of the quantity passed. Since polishing is the final process, the girl has been instructed to pay particular care to the inspection of the polishers' work. The girl employed in bundling the needles does not now inspect them.

With the old system of inspection, there was no way of telling who was responsible for the needles rejected: they were therefore returned to the polishers, who were paid at the rate of one shilling for each gross of pairs renovated. This involves a double loss, for the management pay for the needle to be renovated, and they lose the output of the time spent on renovations.

The following tables gives the number of faulty needles rejected during four days.

Date.	No. of good needles.	Rejections for				
		Bad Points.	Bad Knobs.	Under Knobs.	Knobs Off.	Miscellaneous
April 21	1486	15	467	12	18	7
April 22	1716	2	138	18	20	12
April 23	2160	-	500	1	17	-
April 24	1512	1	62	-	6	2
Totals	6874	18	1167	31	61	21
		1298				

Thus there are nearly one-fifth (18.9 per cent.) as many faulty needles as good ones. No previous records were available of the number of rejected needles, and we cannot determine, therefore, whether this figure is truly representative of the proportion of rejections which occur throughout the year. But if we assume it to be justified, then the cost of renovations at one shilling per gross pairs is at least 5/- per week, or a minimum of £13 per annum.

The rejected needles are now returned to the worker immediately, and he is not paid for any renovations. Thus a saving of at least £13. 0. 0. a year has been effected.

6. Method of Counting.

The outputs of those workers who were paid piece-rates were recorded, either by the Departmental Manager or by his assistant. We were told that half the working day was required for counting, but on taking timings for two days, we discovered that about three hours[1] - a little over one-third of the working day - were required.

Since a supervisor's salary is approximately £3 a week, the time spent on counting was worth a little over £1 a week.

A sighted girl has now been engaged at 18/- a week. A re-allocation of the duties of the sighted girls has been made and, as we have already stated, one of them now inspects and counts the output of each operator in the shop. A saving of two to three shillings a week in wages has thus been effected, and the Departmental Manager and his Assistant have their whole time available for supervising and attending to the workers.

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[1] The exact times were -

On April 21, 2 hours, 46 minutes, 47 seconds.

" " 22, 3 " 5 " 40 "

Counting the needles produced is a lengthy and not very accurate process, and we strongly recommend the purchase of an Avery Machine Balance of the twelve-to-one ratio type, which costs £11.10.0. With this machine, counting is both accurate and rapid. The amount saved in one year on payment for renovations will more than cover the cost of the purchase of this machine. The purchase of the machine, and the recruitment of an additional sighted girl will not involve the shop in any increased expenditure.

The daily output of all processes-including the outputs of the sighted girls who are paid on a time-rate basis - are now recorded on a weekly sheet. This will assist the management in balancing the various processes. When this system has been in use for two or three weeks, we recommend that the girls employed on fixing knobs and 'pimpling' and on 'bundling' should be paid on a piece-rate basis, as an incentive to increase their production.

7. Buying and Selling.

Raw material for knobs is purchased from one firm, while that for stems is purchased from another firm. These two firms supply good materials at low rates, but they frequently fail to supply the material by the promised delivery dates. The work of the shop is therefore suspended from time to time by the lack of raw material. Moreover, the firms are unable to ensure that the rods delivered will be of the exact size ordered. The Departmental Manager will now have time to devote to the whole question of ordering material.

He has a very good knowledge of the trade, and he will have time to devote also to increasing the sales of the needles.

8. Dust.

The air of this shop is full of dust from the capstan lathes, the polishing wheels, etc., and surfaces in the room are coated with dust. The dust is particularly noticeable when the trapping machine is in operation. The apparatus for extracting dust from the room is totally inadequate, the area of the filter bag provided being mainly responsible for the lack of 'pull'. If it were possible to find accommodation in the room for two or more filter bags at least, there would immediately be sufficient pull through the pipes to withdraw the dust. The dust is not responsible for any sickness among the workers; in fact, we understand that they are exceptionally health.

But it affects the belts on the pulleys by drying them, and thereby causing them to slip. Grease is applied constantly to prevent slipping. In three weeks 2/9 was spent on grease for this purpose.

Further, the dust settles on the electric light bulbs, and frequent cleaning is necessary to give the workers the full benefit of the artificial light. Finally, the dust gives the room an extremely dirty appearance: every article has a coat of dust on it. Should the shop be moved to a new site, we strongly recommend that efficient apparatus for extracting the dust should be installed.

III. ACKNOWLEDGMENTS.

We wish to express our appreciation for the co-operation of the staff throughout the investigation. We are especially indebted to Mr. F. E. Alexander, the Departmental Manager, and to his Assistant, Mr. White, for their assistance.

5th June, 1931.

(Signed) G. H. Miles.
Director

APPENDIX I.

HISTORY OF WORKERS IN KNITTING NEEDLE MACHINE SHOP.

Name	Date admitted to Workshop.	Age when started training in Machine Shop.	Previous Occupation.	Why left previous occupation.	Remarks.	Sight.	Wages for week ending 22/4/31
Fosdyke, George.	1.10.26	42	Had small sweet shop at Islington	On account of failing sight about 1924.	Went to our Home at Milton Haven Dec.1925. Became pupil in basket making, April 1926. Found not physically strong enough to learn basket making. Suffers with nerves	Vision fingers at 6 inches.	10/-
Garrett, Edwin.	Feb.1925	19	No previous occupation.	Had to be withdrawn from Royal School for the Blind, Leatherhead, as unable to learn.	Was given 2 months trial in basket making, but it was found he would not profit by instruction.	Totally Blind from birth.	Absent.
Moore, Frederick	July 1916	29	No previous occupation.		Came as pupil in basket making in first place, had 3 years' training but unable to earn sufficient to be self supporting.	Totally blind from 1 year	15/8
Moir, Archibald	25.1.26.	45	Ostrich Feather dyer & odd jobs.	Was unemployed for about 16 years before he came to this Assoc.	Was not considered fit physically for ordinary industrial training.	Vision limited to counting fingers at 1 ft. R. & L.	18/1
Rowell, John	Jan.1927	43	Brewers Labourer until 1925 ?	On account of failing sight.	Was unemployed for about 2 years before he came to this Assoc.	No pupil reaction to light.	10/10
Venes, Samuel	Dec.1925	30	Unemployable		Was five years in basket shop, unable to learn basket making.	Totally Blind from 3 years.	20/1

APPENDIX I. (Contd.)

Name.	Date admitted to Work-shop.	Age when started training in Machine Shop.	Previous occupation.	Why left previous occupation.	Remarks.	Sight.	Wages for week ending 22/4/31
Whitehorn, James	27.9.26.	44	Came from Belmont Institution		Had never done very much work during his life.	Vision with glasses R.& L.less than 6/60	35/11
Yuill, James.		43	Unemployable		Was transferred from Basket Shop, where he was earning 6/- a week.	Totally blind.	5/- time wage
Sumner, Frederick	3.1.29	46	Barman, served in R.A.O.C. from 1.5.17. to 9.8.19.	Left work as Barman, 1924 on account of bad sight	Unemployed for about 4 years before he came to this Association.	R.V.Movement large objects at 6 inches L.V.fingers at 2 ft.	25/11½
Flanders, James	1.4.30.	44	Builders' labourer.	On account of bad sight.	Was in net making dept. at Tottenham Court Road and was dismissed when it closed down in 1928.	R.V.without glasses. Hand movements with glasses wears + 9.D. Sph. L.V.nil.	18/11
Clarke, T.E.	15.1.31.	41	Labourer in a gas metre firm for 15 years.	On account of failing sight.	Had 3 years' Training at Leatherhead - as a mat maker	R.V.fingers at 1 foot L.V.fingers at 1 foot.	Pupil

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APPENDIX II.

COMPARATIVE PRODUCTION OF CAPSTAN LATHES WITH RODS 13 AND 19½ INCHES LONG.

'Depth' of knob (fifteen measured) is 0.28 inches.

Length of stroke of lathe considered is 17½ inches.

When the rod was shorter than the stroke of the machine, 15 knobs were made in 154.5 seconds: the average time per knob was therefore 10.3 seconds.

When the knob is longer than the stroke of the machine, 15 knobs were made in 312 seconds: the average time was therefore 20.8 seconds.

1. Production with rods 19½ inches long.

The machine has to be adjusted by hand until two inches have been cut: the average time per knob is then 20.8 seconds. For the rest of the rod, the machine works continuously: the average time per knob is then 10.3 seconds.

From 17½ inches of rod, 62 knobs are cut in 643.75 seconds.

From the remaining two inches of rod, 7 knobs are cut in 145.6 seconds.

Average time to change a rod is 34 seconds.

Therefore 69 knobs are made in 823.35 seconds.

" number of knobs produced in 39¾ hours (the working week) is 11992.

2. Production with rods 13 inches long.

From 13 inches of rod, 46 knobs are cut in 473.8 seconds.

Average time to change a rod is 34 seconds.

Therefore 46 knobs are made in 507.8 seconds.

" number of knobs produced in 39¾ hours is 12963.

Therefore production with rods 13 inches long is 8.09 per cent. greater than production with rods 17½ inches long.

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Report of Investigation

AT

THE KNITTING NEEDLE MACHINE SHOP,

PECKHAM.

Period: From March 30 to April 2, and from April 20 to April 30, 1931.

Investigator: C. B. Fox.

I. GENERAL SUMMARY OF THE RESULTS OF THE EXPERIMENT. (pp.1,2.)

II. THE MACHINE SHOP. (pp.3- 10.)

1. Trapping for Knobs and Stems. (pp.3,4.)
2. Cutting. (p.4.)
3. Turning on Capstan Lathes. (pp.4,5.)
4. Pointing. (pp.5,6.)
5. Assembling Process. (pp.6-8.)
    - i. Fix knobs and 'pimple'. (p.6.)
    - ii. Polish. (p.6.)
    - iii. Bundle. (pp.6-8.)
6. Method of Counting. (pp.8,9.)
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APPENDIX I. HISTORY OF WORKERS IN KNITTING NEEDLE MACHINE SHOP.

APPENDIX II. COMPARATIVE PRODUCTION OF CAPSTAN LATHES WITH RODS 13 AND 19½ INCHES LONG.

I. GENERAL SUMMARY OF THE RESULTS OF THE EXPERIMENT.

The Machine Shop at Peckham was established on June 10 1924 with four blind men as an experiment in employing those blind workers who were considered unfit for engagement in the trades usually conducted in workshops for the blind. Eleven blind workers are now employed: Appendix I contains the history of each of them. Before coming to this factory, six had been tried for some of the trades conducted by other workshops for the blind and had been rejected. Eight commenced to learn the trade when they were more than forty years old. And yet the majority of the workers earn wages which compare quite favourably with those earned by the blind in other trades.

The figures for the last three financial years show that the shop has not made a net profit.

In the year 1927-8 there was a gross loss of 20.28 per cent.on turnover.
" " " 1928-9 " " " gross profit " 2.73 " " " "
" " " 1929-30 " " " gross " " 23.93 " " " "

Financially, the experiment has not been completely successful. But it must be remembered that few, if any, of the workshops for the blind make a net profit: none of those which we have visited has done so. The shop is at least as successful as many of the workshops for the blind, in spite of the facts that its workers would elsewhere be considered 'unemployable', and that eight of them learned their work at an advanced age.

A further feature of the experiment is the small number of accidents which occur: only five were recorded during the past three years.

The experiment, therefore, has, on the whole, been very successful. It would become still more successful if more blind workers could be employed. There is every reason to suppose that the shop could extend its sales considerably if it desired to do so.

Although no sales representative is employed, orders are obtained for sufficient needles to keep the workers continuously employed. A capable salesman would be able to find new markets for the products of the factory.

Thus it would be possible to extend the work of the factory, although doing so would mean either that the present shop would need enlargement or that a new workshop would have to be found. Whether it is desirable to extend the work depends on the number of blind workers who are 'unemployable' in the other workshops for the blind. If there are sufficient such men, we strongly recommend extension to give them employment.

II. THE MACHINE SHOP.

The Machine Shop consists of one small room, from which the Departmental Manager's office has been partitioned.

The needles are made from casein material, which is purchased in rods. The process of manufacture consists of two distinct parts - the preparation of the stems, and the manufacture of the knobs on capstan lathes. Both parts are worked simultaneously. The steps in the manufacture of needles are as follows.

Preparation of Knobs.			Preparation of Stems.		
Process	1.	Trapping.	Process	1.	Tapping.
"	2.	Cutting.	"	2.	Cutting to lengths.
"	3.	Turning on Capstan Lathes.	"	3.	Pointing.

Assembly.

Process 1. Fix Knobs and Pimple.
" 2. Polish.
" 3. Bundle.

There are in all nine processes, though one man performs both trapping processes, and another man performs both cutting processes. The time available did not permit us to make time and movement studies, although there is ample scope for such work on all processes.

1. Trapping for Knobs and Stems.

Raw material is received in rods of definite lengths, but the manufacturers are unable to guarantee the diameter of the rods. Should rods of 10½ millimetres diameter be ordered, it is quite possible that rods 11½ millimeters in diameter may be received. The cost of the rods is determined by ~~this~~ their weight.

The rods are placed singly in the trapping machine and shaved off to the desired diameter. The operator feeds the machine by passing the rod through an aperture and he withdraws it from the other side of the machine. This operation requires much less time than most of the other operations in the shop. The machine is therefore operated by a man from any of the other processes which is in advance of the work of the rest of the shop. The work is paid on a piece-rate basis.

2. Cutting.

After trapping, all the rods for knobs and stems are cut into lengths by a guillotine.

For the preparation of knobs, the rods, which are usually from thirty-nine to forty-one inches long, are cut into halves. For stems, however, the rods are cut to the length desired for the needles. The work is paid on a time rate.

We recommend that the rods used for knobs should be cut into three pieces, two pieces of which should not be more than thirteen inches long. The reason for this recommendation is explained in the next section.

3. Turning on Capstan Lathes.

There are three lathes, similar in principle, in the shop, but the dimensions of one of them are not the same as those of the other two. Each lathe has its one regular operator who is paid on a piece-rate basis.

The rods are fed into a lathe from one end. If the rod is shorter than the length of stroke of the machine, the machine can be worked continuously; but if the rod is longer, the operator has to stop the machine after preparing a knob, push the rod by hand towards the working end of the lathe, and start the machine. This has to be performed for each knob until the length of rod is less than the length of stroke. The average time taken for preparing a knob when the rod is longer than the stroke is 20.8 seconds, whereas the average time required to prepare a knob when the rod is within the capacity of the machine is 10.3 seconds. Appendix II shows that if the length of rod for this lathe were thirteen inches, there would be an increase in output of 8.09 per cent.

The lengths of stroke of the machines are 25½, 17½ and 15 inches. Maximum production will be obtained if, as already recommended, two pieces not more than thirteen inches long are cut from the rods: these two pieces will be turned on the lathes with the shortest strokes. The length of the remaining piece will vary between thirteen and fifteen inches; it will be turned on the lathe with the longest stroke.

4. Pointing.

One man is continuously employed on this process, and his work is paid on a piece-rate basis. He takes a needle from a box and pushes it through an aperture until the end comes in contact with a grinding wheel. He then rotates the needle between his fingers until the wheel has ground the end of the needle to a point. The process is then finished, and he deposits the needle in a box placed eighteen to twenty-four inches away.

It seemed probable that the process would be quickened if the worker held several needles in his hand while pointing another one, since it would reduce the stretching necessary to reach the box in which the unpointed needles were kept. A further saving of time would result from the use of a chute from the lathe to the box in which the pointed needles were collected. We therefore arranged to try this new working method experimentally. Unfortunately, the worker, who is usually employed on this lathe, fell ill: in his absence, the experiment was tried with another worker. His average time for pointing a needle was 7.85 seconds, after three days' practice. The average time taken by the other worker, using the old method, was 11.93 seconds per needle - over four seconds longer than the time taken by his substitute with the new method. Obviously, this is no proof of the superiority of the new method, but it is an indication that the alterations made may effect very considerable savings of time. We therefore strongly recommend that the new method be given a further trial and, if the results are satisfactory, that the new method be adopted.

5. Assembling Process.

i. Fix knobs and 'pimple'. Two sighted girls are employed on this process and they are paid on a time rate.

'Pimpling' is performed by flattening the head of the knob (after it is fixed to the stem) against a grinding wheel. The knobs are sometimes dented by the capstan lathes, and it is the duty of the girls to remove the indentations.

Since this work is paid on a time-rate basis, output was not recorded. We have now introduced a system for recording the output of each process so that the management may realise the value of balancing the various processes, one with the other.

After 'pimpling', the needles are sent to the polishers.

ii. Polish. The needles are polished in the usual manner. There are five polishers and one pupil. The output of the journeymen is recorded since they are paid on a piece-rate basis. The output of one of them greatly exceeds that of any of the others, and this is due entirely to his ability. The ability of the others is comparable with that of the 'less employable blind'.

iii. Bundle. A sighted girl was employed at this process: she was paid on a time-rate basis. She first inspected the material, then collected the needles in pairs, and packed them in a slip of paper labelled "London Association for the Blind". She recorded her own output.

The system of having one girl both to inspect and to pack the finished needles involves the danger that the inspection may become lax if a batch of needles is required immediately to complete an order. For this reason a system of continuous inspection was introduced. A sighted girl collects needles at definite periods from each worker, inspects and counts them, and then passes them on to the next process. At the same time, a record is made in the worker's book of the quantity passed. Since polishing is the final process, the girl has been instructed to pay particular care to the inspection of the polishers' work. The girl employed in bundling the needles does not now inspect them.

With the old system of inspection, there was no way of telling who was responsible for the needles rejected: they were therefore returned to the polishers, who were paid at the rate of one shilling for each gross of pairs renovated. This involves a double loss, for the management pay for the needle to be renovated, and they lose the output of the time spent on renovations.

The following tables gives the number of faulty needles rejected during four days.

		Rejections for				
Date.	No. of good needles.	Bad Points.	Bad Knobs.	Under Knobs.	Knobs Off.	Miscellaneous
April 21	1486	15	467	12	18	7
April 22	1716	2	138	18	20	12
April 23	2160	-	500	1	17	-
April 24	1512	1	62	-	6	2
Totals	6874	18	1167	31	61	21
		1298				

Thus there are nearly one-fifth (18.9 per cent.) as many faulty needles as good ones. No previous records were available of the number of rejected needles, and we cannot determine, therefore, whether this figure is truly representative of the proportion of rejections which occur throughout the year. But if we assume it to be justified, then the cost of renovations at one shilling per gross pairs is at least 5/- per week, or a minimum of £13 per annum.

The rejected needles are now returned to the worker immediately, and he is not paid for any renovations. Thus a saving of at least £13. 0. 0. a year has been effected.

6. Method of Counting.

The outputs of those workers who were paid piece-rates were recorded, either by the Departmental Manager or by his assistant. We were told that half the working day was required for counting, but on taking timings for two days, we discovered that about three hours[1] - a little over one-third of the working day - were required.

Since a supervisor's salary is approximately £3 a week, the time spent on counting was worth a little over £1 a week.

A sighted girl has now been engaged at 18/- a week. A re-allocation of the duties of the sighted girls has been made and, as we have already stated, one of them now inspects and counts the output of each operator in the shop. A saving of two to three shillings a week in wages has thus been effected, and the Departmental Manager and his Assistant have their whole time available for supervising and attending to the workers.

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[1] The exact times were -

On April 21, 2 hours, 46 minutes, 47 seconds.
" " 22, 3 " 5 " 40 "

Counting the needles produced is a lengthy and not very accurate process, and we strongly recommend the purchase of an Avery Machine Balance of the twelve-to-one ratio type, which costs £11.10.0. With this machine, counting is both accurate and rapid. The amount saved in one year on payment for renovations will more than cover the cost of the purchase of this machine. The purchase of the machine, and the recruitment of an additional sighted girl will not involve the shop in any increased expenditure.

The daily output of all processes-including the outputs of the sighted girls who are paid on a time-rate basis - are now recorded on a weekly sheet. This will assist the management in balancing the various processes. When this system has been in use for two or three weeks, we recommend that the girls employed on fixing knobs and 'pimpling' and on 'bundling' should be paid on a piece-rate basis, as an incentive to increase their production.

7. Buying and Selling.

Raw material for knobs is purchased from one firm, while that for stems is purchased from another firm. These two firms supply good materials at low rates, but they frequently fail to supply the material by the promised delivery dates. The work of the shop is therefore suspended from time to time by the lack of raw material. Moreover, the firms are unable to ensure that the rods delivered will be of the exact size ordered. The Departmental Manager will now have time to devote to the whole question of ordering material.

He has a very good knowledge of the trade, and he will have time to devote also to increasing the sales of the needles.

8. Dust.

The air of this shop is full of dust from the capstan lathes, the polishing wheels, etc., and surfaces in the room are coated with dust. The dust is particularly noticeable when the trapping machine is in operation. The apparatus for extracting dust from the room is totally inadequate, the area of the filter bag provided being mainly responsible for the lack of 'pull'. If it were possible to find accommodation in the room for two or more filter ba~~g~~ys at least, there would immediately be sufficient pull through the pipes to withdraw the dust. The dust is not responsible for any sickness among the workers; in fact, we understand that they are exceptionally health.

But it affects the belts on the pulleys by drying them, and thereby causing them to slip. Grease is applied constantly to prevent slipping. In three weeks 2/9 was spent on grease for this purpose.

Further, the dust settles on the electric light bulbs, and frequent cleaning is necessary to give the workers the full benefit of the artificial light. Finally, the dust gives the room an extremely dirty appearance: every article has a coat of dust on it. Should the shop be moved to a new site, we strongly recommend that efficient apparatus for extracting the dust should be installed.

III. ACKNOWLEDGMENTS.

We wish to express our appreciation for the co-operation of the staff throughout the investigation. We are especially indebted to Mr. F. E. Alexander, the Departmental Manager, and to his Assistant, Mr. White, for their assistance.

5th June, 1931. (Signed) G. H. Miles.
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